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Seymour's Differential Vernier Press.

On pages 1 and 2, we give five perspective engravings, showing views of a stamping press which has a new differential vernier for regulating the travel of the die, the invention of James M. Seymour. Hitherto it has been almost impossible to adjust a press close enough for delicate work, hours often being expended in getting the dies to the required movement. Sub-presses and other complications have generally been resorted to with a view of obtaining an approximation to accuracy: but even then the results were not satisfactory, guess work and the skill of the operator having much to do with the success of an adjustment. The press illustrated herewith enables the operator to regulate the travel of the stamp just as closely as distance can be gauged by micrometer calipers.

Figure 1 gives a full view of the press in working order. Figure 2 gives a distinct view of the differential vernier as it appears at work on the end of the stamp-operating shaft. The small disk that appears in the center of this figure is the end of the driving shaft, and is a journal on which the differential vernier block moves. This journal is not turned true to the axis of the main shaft, but a certain distance away from the center, which, in this case, is $\frac{5}{8}$", so that it acts as an eccentric, imparting vibratory motion to the rectangular block by its revolutions.

The rectangular block, which appears in figure 3, consists of two parts that are shown separately in Figs. 4 and 5, on page 2. The cylindrical dial, Fig. 4, is bored out slightly eccentric, and it is made to act the part of a circular vernier, as it performs the same functions in regard to adjustment as are done by the sliding jaws of vernier calipers. This is believed to be the first instance on record where the vernier has been adapted to circular action. The circle of holes drilled through this cylinder is made to connect with a series of holes drilled in the inner part of the block into which it fits.

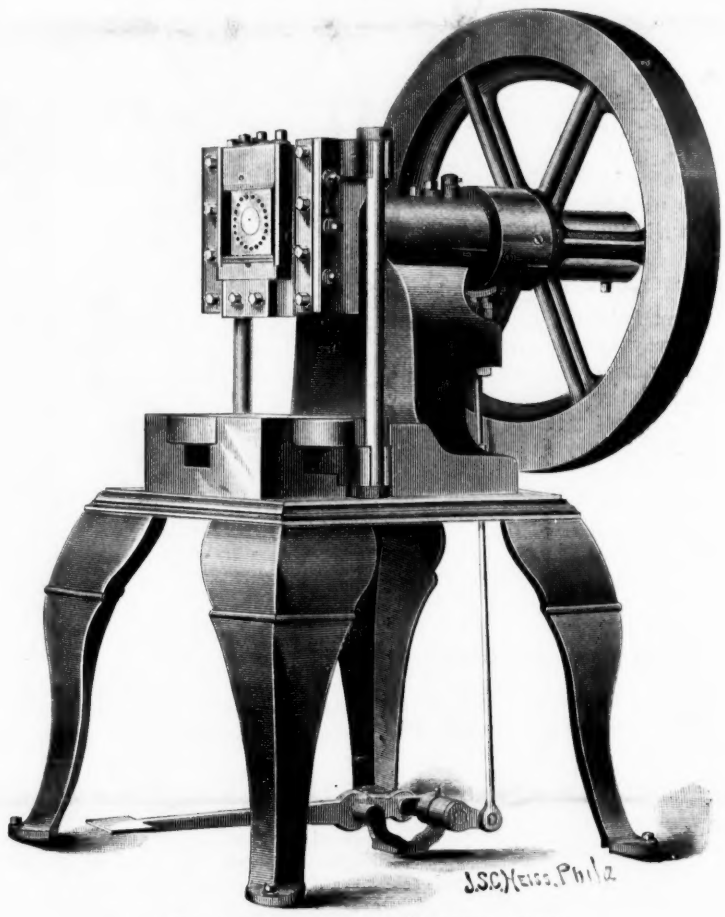


FIG. 1.—DIFFERENTIAL VERNIER PRESS.

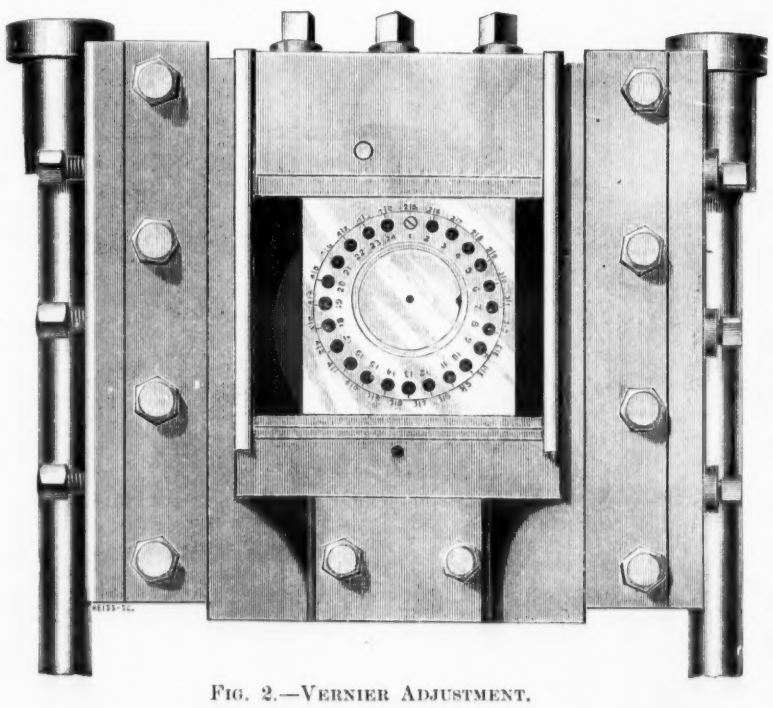


FIG. 2.—VERNIER ADJUSTMENT.

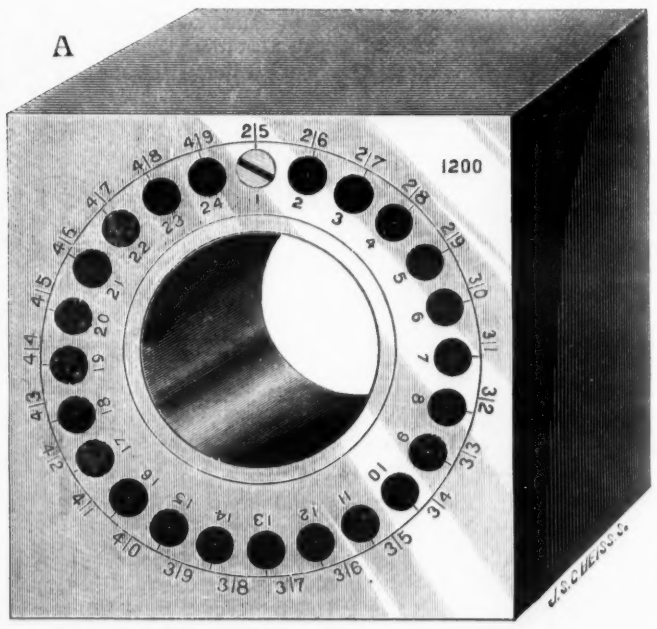


FIG. 3.—RECTANGULAR BLOCK.

Turning to Fig. 2, the circle of figures seen inside the dial represents the numbers of the holes beside them; the outside figures are the numbers of the holes inside the block. As the block now stands, hole 1 is connected with hole 25, and the narrowest part of the eccentrically bored cylinder—which acts as a bushing for the shaft—is on the top, and the die bar will receive its greatest travel. By turning the dial a very slight distance, so that the pin will go into the next hole, the throw of the die bar will be reduced $\frac{1}{1200}$ of an inch, which is the smallest variation this press is made for. Two holes will reduce the travel $\frac{1}{600}$ of an inch, and so on till the thick part of the eccentric gets to the top, which exhausts the adjustment. Whatever may be the position of the dial, one outside hole will coincide with one inside hole and no more, and the relative positions of the holes will be indicated by the figures being in line.

The extremely fine graduations of movement rendered possible by this invention is found to be very valuable in the production of certain qualities of work. In stamping thin gold watch-cases, for instance, a difference of $\frac{1}{1000}$ of an inch in depth is often of the greatest consequence, and marks the distinction between good and inferior work. Yet, until this differential vernier adjustment was invented, it was found impossible to regulate the movement of a stamp by exact thousandths of an inch. This method can be extended to regulate a stamp to the $\frac{1}{10000}$ of an inch if necessary. As an example of the accuracy of this adjustment, a thin piece of paper can be placed on a steel block and cut by a sharp cutter without injuring the edge of the tool. Nor is the operation of the press confined to such fine work as watch-cases and escapements. Dies making an impression of 15"x20" can be worked without injuring the press for fragile operations. The feature of accurate pressure is sometimes almost as valuable for heavy work as it is for the finer manipulations. It is important to get the pressure on metal just the right tension for disintegrating the sheet so that it shall remain in shape, otherwise it has a tendency to buckle in spots.

The same principle of vernier adjustment can be applied for rolling metal. Where precious metal sheets are required of an exact thickness, it is expected that this system will be found especially useful. The change of length due to variations of temperature can be compensated for promptly by this press, for changing the length of die-bar movement takes only a minute or two, and the extent of the change made is always understood.

The vertical brace rods for stiffening the press are solid. They are expanded by heat to reach over the holding lugs, and on cooling they take a firm hold that makes a most substantial job. Lost motion in the guides of the vernier block can be taken up by the screws on top and at the right of Fig. 2. The clutch for connecting the shaft, which gives motion to the die-bar, with the power wheel has certain excellent features about it for throwing the press out of gear with certainty. This is an important point, for one stroke too much would often cause serious damage by destroying valuable work. The arbor of the power wheel connects with the main shaft by a heavy collar on the latter, and they are held in gear by a prismatic key, which can be moved out at the will of the operator.

Several parties who have this press in operation speak of its action in the highest terms. It is made by Seymour & Whitlock, Lawrence street, Newark, N. J.

As the investigation into the cause of the *Ricerdale* boiler explosion proceeds, the rotten condition of the boiler becomes more conspicuous. Had the corroded sheets been properly tried by a hammer test, a sharp blow from a hammer would have knocked a hole in the boiler.

American machinery and manufactures are reported to be finding a market in Smyrna, that ancient city of Asia Minor, said to be the birthplace of Homer. The demand must have reached some importance, for the genuine American article is suffering from imitators of other nations who attempt to cheat the Asiatics by putting American brands upon their inferior wares. Smyrna is the chief commercial city of Asia Minor and is an *entrepôt* of trade for a vast territory, all nations of the Eastern hemisphere meeting there to sell or buy commodities. From that center whose arms reach away into what might be called the fountain-head of agriculture, a demand comes for American agricultural implements. These Orientals must be waking up, for the methods of agriculture described by Homer are still in vogue among them, which consists of scratching the earth with a sharp stick in place of a plow, and trampling the grain on the barn floor by oxen in lieu of threshing. Some new prophet of progress must have been round among these people, since they are hankering after sulky plows and perfected threshing machines.

Penning's Steam Joint.

In the accompanying engraving we illustrate an improved steam and hydraulic joint, which is the invention of Mr. Edw. Penning of No. 20 Abingdon street, Westminster, and which was exhibited at the late engineering exhibition.

The system may be briefly described as grooves of a triangular shape, cut in the flanges of pipes, into which grooves rings of a similar section are inserted, forming, when the joint is made, a triangular or wedge-shaped washer, of which the apex is nearest the periphery. These washers are made of prepared or ordinary india-rubber, patent packing, asbestos or any suitable material.

It will readily be understood that from the form and position of the washer in the joint it will resist any known pressure, being also by its construction of great service in facilitating the rapid and efficient replacement of any length of pipe required.

We understand that this joint has been tested and proved successful at Sir W. G. Armstrong, Mitchell & Co.'s works at Elswick, under a hydraulic pressure of 4,000 lbs. Its simplicity, impermeability and other good qualities commend it to the attention of our readers.—*Iron.*

Rail-Lifter.

The engraving with this represents a device for lifting rails, manufactured at the Rondout Iron Works, Rondout, N. Y. It is designed to facilitate and cheapen the operation of rail-lifting, as usually performed by several men by the aid of a long lever or bar, as by its use one man can perform the work more satisfactorily.

The device consists of a cast-iron shoe, to one end of which a steel lifting lever is pivoted, the other end of the lever being lifted by means of a screw. The nut for the lifting screw is cylindrical, and rests against a cylindrical seat on the under side of the lever. The hardened end of the screw is ball-shaped, and rests in a correspondingly shaped seat chilled in the shoe.

By this arrangement the screw and nut accommodate themselves to the inclination of the lever as it is raised or lowered. The nut and screw are of steel. The device is so light that one man can handle it, and it can with safety be left in position under the rail during the passage of a train. The manner in which it is used is clearly shown in the engraving.

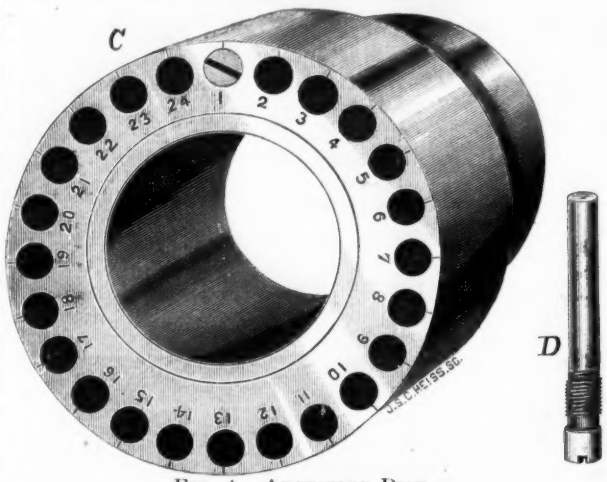


FIG. 4.—ADJUSTING DISK.

The newest fashion in the way of locomotive improvement is a revolving cow-catcher. A patentee proposes to run a toothed cylinder in front of the engine truck to clear away obstructions and scoop any cows, hand cars, train wreckers' outfits or other obstacles over the smoke stack.

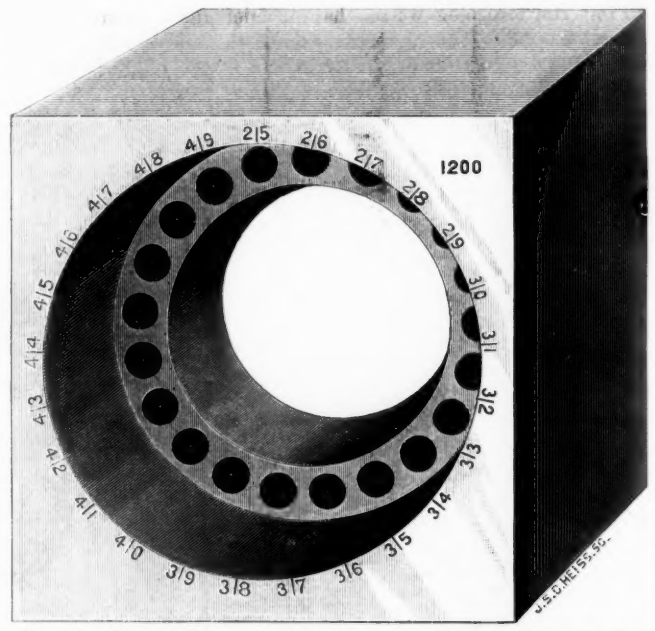


FIG. 5.—INSIDE VIEW OF RECTANGULAR BLOCK.—See page 1.

Trial Trip of a Wootten Locomotive.

BY ANGUS SINCLAIR.

One morning recently, by a previous arrangement, I joined a train on the Philadelphia & Reading Railroad at West Falls, for the purpose of making a trip over the road with one of the large consolidation locomotives built with the Wootten fire-box, that I might have the opportunity of observing the behavior of the engine while burning anthracite slack coal during a long, heavy pull. I had previously noted the performance of a slack burning locomotive on short runs, but that kind of trial is unsatisfactory. One needs to watch an engine doing a day's hard work to judge properly of her capabilities.

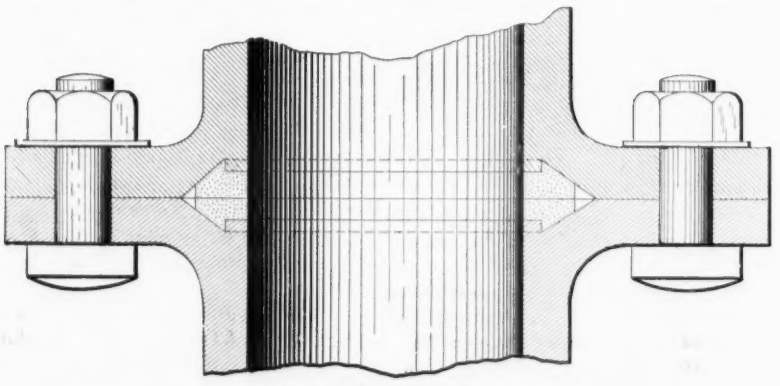
This train consisted of 151 empty coal cars weighing 527 tons 13 cwt. and was rather more than one-third of a mile long, the distance from tank to caboose being 1,950 feet. The engine was built by the Baldwin Works, and is the standard consolidation class of this road with cylinders 20″×24″ and drivers 50 inches diameter outside the tires. The fire-box, which is the novel feature of the engine, overhangs the back pair of drivers whose axle is enclosed by the ash pan. In length this fire-box is 9 feet 6 inches with a width of 8 feet, giving a grate area of 76 square feet, and a direct radiating surface of 148 square feet. The tubes, numbering 197, are 10 feet 7¼ inches long, and with the fire-box make up a total heating surface of 1,241 square feet. The entire weight of the engine is 103,000 pounds, of which 90,000 pounds rest on the drivers.

The train started from Port Richmond and had come five miles to the point where I joined it. The traveling engineer of the road was with the engine, and he had made arrangements for getting the weight of the coal and the quantity of water used. This was done very simply, yet with accuracy near enough for practical purposes. The coal boards of the tender are far enough back to leave room for a space to fire from.

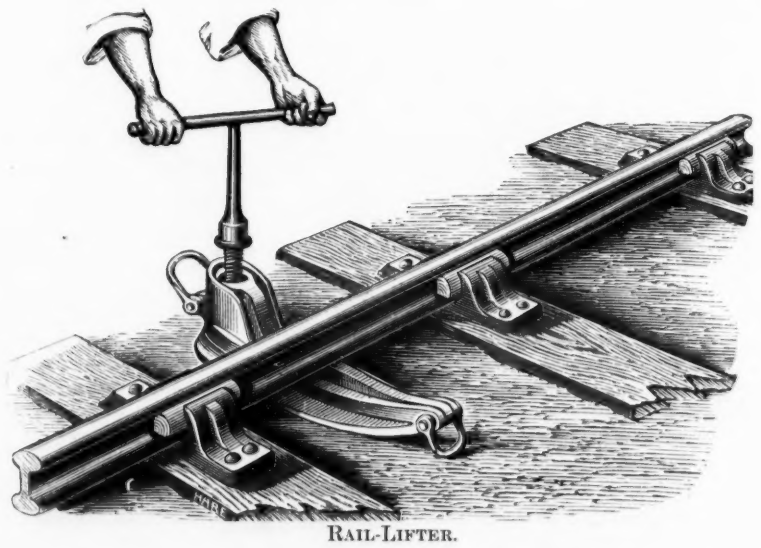
This space was cleared, and five baskets of coal measured and placed upon it for the fireman's use. This was repeated all through the trip as the coal was required. Each basket contained 75 pounds, and the measurement was taken in a way that left no more chance of a variation than there is in measuring bushels of wheat. The water measurement was ascertained by means of a float, the method employed by the eminent Scotch engineer, D. Kinnear Clark, in many of his recorded experiments with the locomotive.

When I got on to the engine, there was a full body of coal on the fire spread over the grates evenly to a depth of four or five inches, which was the average body of fire carried during the trip. The surface of the fire looked dark and inactive, and a superficial inspection was apt to leave the impression that it was very poor to start out with a heavy train. While standing about stations the draft of these engines is checked by means of a register in the smoke-box door which admits of one square foot of opening when needed. This register was frequently used by the engineer while on the road to check the steam raising, and it obviates the objectionable practice of throwing open the fire-box door so often resorted to on most of roads as a means of checking the steam.

When the train was ready to pull out, the fire doors and register were closed, and a glance at the fire after the engine had moved a few rods showed that it had brightened up wonderfully. It then resembled the fire in a hard coal base-burning stove when it is burning bright with the draft open. The grade out of West Falls rises 33 feet to the mile, with several sharp curves. In pulling the train up this ascent the engine worked as if the train was far beneath its maximum load. The engineer started with the reverse lever well ahead, giving the valves a free travel till the train was going, then he kept hooking back till the lever was in the 9″ notch. After getting over the heaviest part of the grade, he got the lever into the notch next the center, cutting off at about 6″, and in this position the train was kept going at a speed approaching 20 miles an hour. We made a run of 78 miles in 4 hours and 20 minutes, running time. The road follows the course of the Schuylkill River and rounds a great many curves, besides rising 394 feet in the distance of 78 miles. There is no part of the track undulatory, it is a steady rise from the start, varied only by light and heavy pulls. In several places where the curves were sharp on stiff ascending grades the train seemed to pull harder than it did in making the start on the 33 feet grade. At these points the engineer advanced the lever a notch for a few minutes which gave sufficient additional steam to maintain the speed. The coal used was clean anthracite slack, the pieces mostly being about the size of peas and varying up to the size of a small chestnut. Firing was done by throwing on about 200 pounds at a time, scattering it evenly over the grates. When working at its hardest on the heavy pulls the exhaust of the engine did not exert much suction on the surface of the fire. It would make the smaller particles on the surface of the fire dance, and it had a tendency to work the coal forward, but it seldom drew sparks through the tubes. All through the trip the engine steamed remarkably free and the register was often opened slightly to keep the steam from blowing off, yet the fire never assumed the white incandescence so common with engines working hard. The fire inclined to burn white round the sides and in the back part, the draft breaking through these points most readily. This tendency was systematically checked by firing these portions a little heavier than the other parts of the fire. After we had run four or five miles, I reached under the fire and felt the grates with my hand. The temperature was not high enough to burn the hand although the fire was quite bright beneath. Combustion all over the large grate area was even, so that no great intensity was necessary. These engines have no petticoat pipe for regulating the draft through the tubes. This is effected by a movable apron in the smoke-box, which reaches diagonally downward from above the upper



PENNING'S STEAM JOINT.

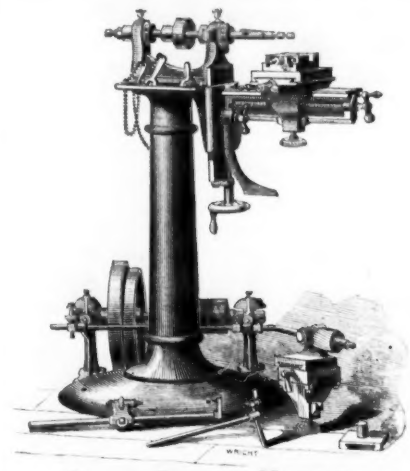


RAIL-LIFTER.

row of tubes. It performs its functions very satisfactorily, and this engine had a remarkably even draft. There was no means of shaking the grates. When any point about the fire began to assume an inactive appearance the fireman raked it and generally dragged out a partially formed clinker. It was only in two or three cases that this was found necessary. The system followed in fire management is to fire light and at frequent intervals. The need for heavy local draft is prevented by keeping the fire free from clinkers that would prevent any part of the fire from performing its share in the operation of combustion.

Two No. 8 Sellers 1876 Injectors were used for feeding the boiler, but one of them did the work. It was kept going all the time, and was throttled by the regulating lever to give just the necessary supply. The notch was seldom changed unless when we stopped at a station. As there used to be persistent prejudice among engineers against injectors, I questioned the runner of this engine about his sentiments on the subject, and he expressed himself as being decidedly in favor of injectors.

During the run of 78 miles the engine burned 9,375 pounds of coal, and in doing so evaporated 7,156 gallons of water. This was an expenditure of 120 pounds of coal to the mile, and each pound of coal evaporated 6.35 pounds of water from a temperature of 80 degrees Fahrenheit. This was a very good evaporative duty and is seldom reached by locomotives on light service with ordinary fire boxes burning the best kinds of bituminous coal.



CUTTER GRINDING MACHINE.

Drill-Press Designs.

BY OBERLIN SMITH.

In a paper last week upon drill-presses were discussed various details of mechanical construction, leaving for this article an analysis of designs for main frames. The particular variety of machine recommended in the last paper, as most popular and generally useful, is shown in outline in the accompanying engravings, Figs. 3, 4, 5 and 6, the feed arrangements and various other details being omitted. One of its distinguishing features is the adjustable head, *H*, the word head being used to denote the casting which carries the lower spindle bearing, feeding wheel, etc.

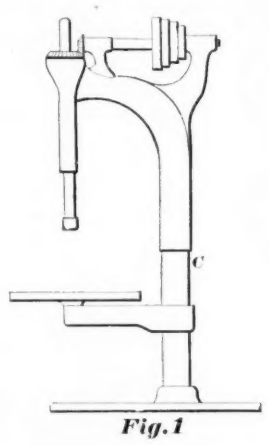


Fig. 1

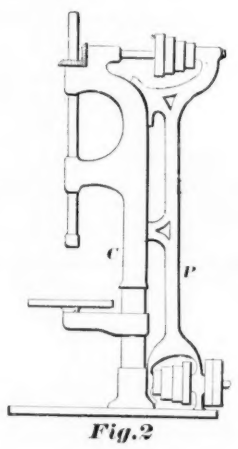


Fig. 2

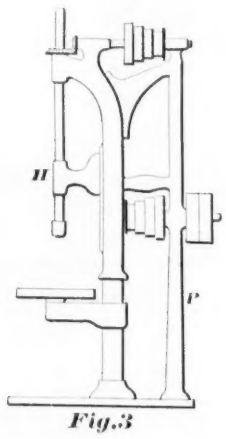


Fig. 3

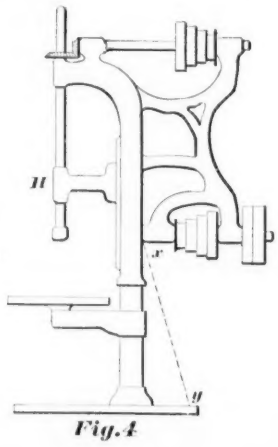


Fig. 4

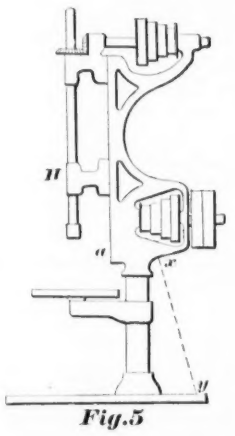


Fig. 5

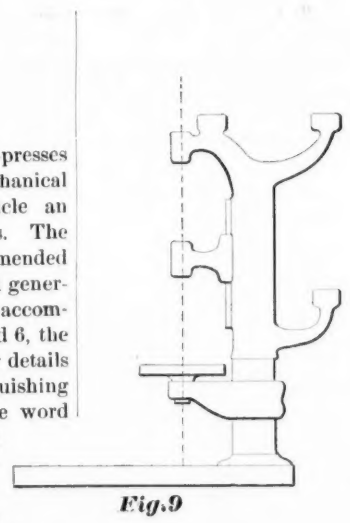


Fig. 9

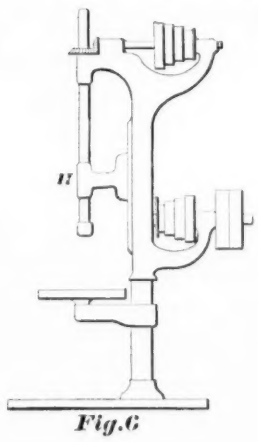


Fig. 6

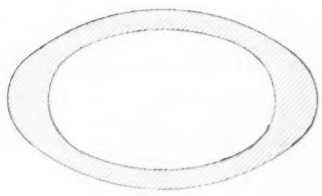


Fig. 7

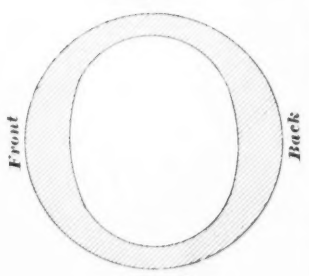


Fig. 8

In Figs. 1 and 2 are shown two styles of machines with stationary "heads."

Fig. 1 is arranged for an independent countershaft and stands upon a single column, *C*.

Fig. 2 has a countershaft attached, and has the column stiffened by a bracing post, *P*.

These last machines are far less useful for general work than the other kind, as the spindle cannot be brought down to drill low work set upon the bed-plate—that is, not unless it is made to project so far out of its bearing as to make it very springy. This construction also necessitates a very long stroke in the feed motion. Considering the little extra expense involved in the movable head, it is a wonder that these others should still be manufactured—especially as a high-priced, well-built article.

Assuming, then, the superiority of the movable head, let us consider the chief points in a good design for a frame. The principal stresses to be met are as follows: 1st, *upward* against the spindle, and *downward* upon the table or bed-plate, owing to the thrust of the drill in feeding; 2d, *torsionally* upon the spindle and table, and consequently upon the column, due to the rotary cutting of the drill; 3d, down and laterally upon the column, from the weight of the parts above, and of the work when placed upon the table. In the latter case, we need consider only the distortion of the column and table-arm, produced by exceptionally heavy work (which cannot well be put as low as the bed-plate) when laid upon the table, this process not having as nugatory an effect as it usually does upon bills in Congress. The weight of the machine itself is, of course, of too slight effect to take practical account of. There are, in addition to the above, some incidental side stresses upon the head and the table, due to the work being held from revolving at some one point, radially outward from the drill rather than at two opposite points, as it should be. These, however, are slight compared with the strength already provided to resist them in all good machines

From the foregoing we see that the chief distortion to be guarded against, in the main column, is on account of stresses first and third lateral, and chiefly tending to tip backward the upper end, the side stress being comparatively small. From stress second we find a twisting tendency only. To meet all this the usual construction of a round, hollow column seems the obvious one, especially as a cylindrical form is necessary for the table-arm to swing upon. If it were not for the latter fact, a column of elliptical cross section (see Fig. 7) would meet all requirements, both mathematical and æsthetic. The cylindrical shape being a fixed factor in the matter, various attempts have been made to obtain the desired additional resistance to the backward stress by an extra post *P*, Figs. 2 and 3, forming a brace or truss to the main column and supporting the countershaft. This, being one side of a parallelogram, makes a very poor brace. It is usually remarkably ugly in appearance, and, as it must be bolted on separately to allow of the column being turned, is always adopted at the expense of simplicity, and consequent economy. If a column must be made so small as to need bracing, the proper thing would seem to be a diagonal brace at *x y*, Figs. 4 and 5.

In criticising the appearance (and amount or waste metal) of the designs shown, which, by the way, are about as these machines are made by several of the best American manufacturers, I should say that the least beautiful was Fig. 3, with its straight extra post, most peculiarly connected to the main column. It is, however, stronger than the others against backward deflection. I should place next in the list Fig. 4, with its wonderful harp-like structure to support the countershaft. Next would come Fig. 5, which is really somewhat graceful, but objectionable on account of the straight-head bearing at *a* being too far forward, and thus limiting the capacity for "swinging" large work which happens to be set high up in the machine. Fig. 6 is almost ideally perfect, the metal seeming to have grown, so to speak, just where it is wanted—as the branches of a tree do. It is, however, much too slim for proper stiffness, both in the column and the table-arm, also in thickness of bed-plate. The latter has the usual fault of not extending nearly far enough forward. More pictures might be shown of machines by good makers which are of far worse design than these, many of the journal bearings and other small parts being clumsily bolted on that ought to form a part of the main shafting.

If I were to design a drill press, I think the frame would look something like Fig. 9, the general arrangement of pulleys, spindle, etc., being about as in Fig. 6. Stiffness of column would be attained by making it of much larger diameter than usual—say, from 50 to 100 per cent. It could be made but little heavier than the present braced columns by being very thin at the sides and thick at the front and back, as shown in cross section in Fig. 8. This would give a proper distribution of metal for the various stresses. The table-arm should also be much deeper than usual to prevent its springing downward. Fig. 9 is drawn to the same scale as Fig. 6. It will be seen that it is much clumsier, and that the bed-plate is thicker and a great deal longer. If there is any reason why the desired result should not be attained in this simple way, rather than by complicated forms often used, let the reasoner state the same.

Improved Cutter Grinding Machine.

The cut herewith shows recent improvements that have been made in the cutter grinding machine, manufactured by E. E. Garvin & Co., 139 to 143 Centre street, New York City.

The construction has been simplified by substituting a planed knee for the heavy stud in former use. A sliding platform, made to move more freely than in the old-style machine, is fitted to this knee, and is bound in any desired position by tightening a gib by means of a hand-screw shown beneath.

A special attachment is also provided for this machine, when required, for surface grinding. The cut shows it in position on the machine, with the cutter grinding head and adjustable guide on the floor. The machine can be changed from a cutter grinder to a surface grinder in a few minutes. Upon the sliding platform is a stand capable of being bound by a cam binder at any desired angle. This stand is used for the mandrel stud, and has a graduated arch of 90° for setting the stud at any angle. The centers shown in cut enables the operator to sharpen reamers and taps of almost any shape.

With this machine all sizes and shapes of cutters can be handled from ½″ to 8½″ diameter, and face mills, by using platform, shown at foot of machine, up to 12″ diameter.

The arrangement is such that plenty of space is allowed for the hands in sliding the work upon the mandrel. The slide and spindle bearings are sheathed and covered with cap nuts for the exclusion of dust and emery. The spindle boxes have adjustment for wear, and the sliding surfaces are substantially gibbed.

This surface grinder will grind a piece 10″ long and 8″ wide. The slide is operated by a rack-and-pinion movement, making it very sensitive and quickly handled. The cross-feed is operated by a screw attached to the end of the knee. This attachment is very useful in grinding small hardened work, such as straight-edges, cutting dies, caliper gauges, etc. Small pieces can be held in a vise made fast to the slide for that purpose. Drift and wrenches accompany the machine.

The countershaft, with tight and loose pulleys, 4¼″ by 2″ face, runs 400 revolutions per minute in self-adjusting and self-oiling boxes.

A patent has lately been secured for a pipe-bending machine, an article that has been produced long after an urgent demand for such a device was felt in every pipe-fitting shop in the world. Pipe bending, although in constant operation, has been done by the most awkward forms of mechanical makeshifts, the consequence being that a great many pipes are permanently injured by the rough act of bending. The new patent appliance for pipe bending consists of a collar to receive the end of the pipe, from whence it is drawn round a circular groove by a roller attached to a bifurcated lever. The machine looks capable of doing the required work. It is patented by Robert Reach, Washington, D. C.

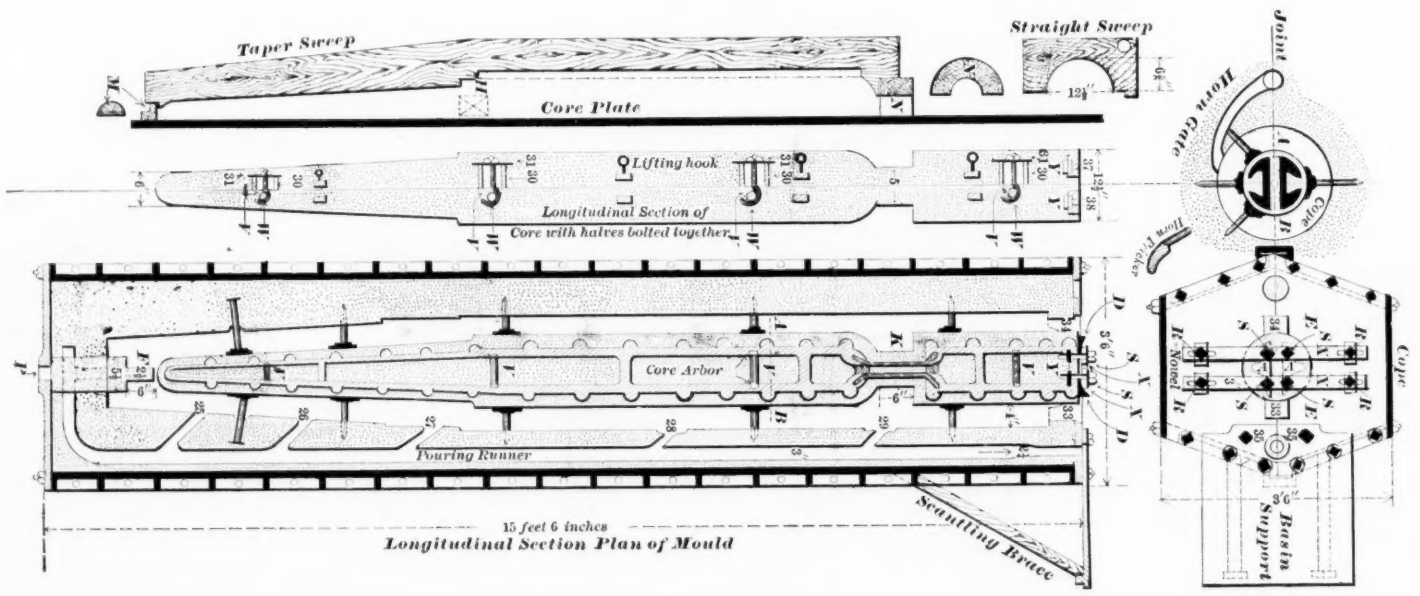
Moulding a Hydraulic Hoist Casting in Dry Sand.

BY THOS. D. WEST.

The engraving herewith shown presents ideas of gating and coring that may often be found useful. The casting when done was finished its entire length to an exact size, and required to be clean and sound. The mould was made by the use of a sweep attached to a spindle, one end of which had a bearing in the journal *P*, and the other end in strap, not shown, which was bolted to the end of the flask through the holes, *E, E*, seen in the end view.

Before blacking the mould the runner and gates were cut. One gate admitted the metal at the bottom, and as the mould filled up, the metal entered through the side gates. These gates were made slanting from the runner upward, in order to help to prevent the mould from cutting or scabbing. With a gate thus cut it is very evident that little or no iron can run into the mould until the metal has risen nearly to the gate. If this can be accomplished, there is very little danger of the core or mould surface being cut upon the metal entering the mould, which would, of course, be very liable to spoil the casting.

Some one may feel like asking: Why are there so many side gates, and could not the mould be run entirely from the bottom gate? The mould could be run by one bottom gate, but by its use alone the metal, as it rose upwards, would be sluggish and dull, and the dirt would not float up to the top of the casting, about six inches of which is cut off. By having the gates as shown there will be about as hot metal to fill the top portion of the mould as there is at the bottom, thereby assisting the dirt to float up to the riser head.



The upper portion of the pouring runner will be seen to be 2¼″, while below it is 3″. The idea of making the upper part smaller was to help to prevent the metal from running into the mould until the proper time. Had the runner been 2¼″ for its entire length, it would most likely have filled, so as to make one unbroken column of flowing metal, thereby causing the metal to run into the mould through every side gate. By having the runner as shown it is evident that the 3″ portion would take metal faster than was admitted through the 2¼″ part, thereby preventing the metal in runner from rising much higher than that in the mould.

Some may think it would be a good plan to use a horn gate, as seen attached to the cope section, *A, B*, in the place of the straight gates. It would certainly assist the dirt to rise if the metal whirled, but if the horn gates were used the extra labor they would make would hardly be paid for in what little benefit might be derived; especially as the chaplets would tend to stop the whirling of the metal. However, if used they would require to be set slanting.

The gates, Nos. 28 and 29, are shown cut into a projection, a wrinkle founded upon a principle that could be applied to the making of many castings.

The first one of these castings I made had a defect, in the shape of a hole about ¾″ deep in front of each one of the upper V gates. By the use of a little common sense I saw what I should have thought of before, which is simply that a light body of iron will contract faster than a heavy one. The runner being much the smallest body, its length would naturally contract faster than that of the casting, and in doing this the weakest point must break. In this case the weakest point was where the gate connected with the casting. The surface of the casting being in a half molten condition, the gate would carry away a portion of it. By enlarging the casting about ¾″ at this point (which was about the depth of hole the withdrawal of gate would leave), there was no further trouble. The projection, in clearing the casting, is of course chipped off, which would then leave it at this point full and sound.

In the core as set into the mould there will be seen two small necks, *F* and *K*. The diameter at *F* being only 2½″, I did not think it would safely support the weight of the upper core; therefore I devised the plan of hanging the core from the flask.

With the exception of the wrought iron rods shown in the neck, *K* and at *V*, the core arbor is all cast-iron. In making this arbor, its form was marked off on a level bed, and then cut out with a gate cutter, the rods, *K* and *V*, being set in. The horn pricker shown was then pushed into the sand at about every 9″ along the length of the mould, as seen by the projections on the arbor. In the upper end of each arbor there were cast two nuts *Y*. Into these were screwed bolts, *S, S*, the heads of the bolts being screwed up tight against the wrought-iron plates, *X, X* (the thickness of which is one inch). Between these plates and the end of the core arbor were placed wrought-iron wedges, *D, D*. The plates, *X, X*, not only held up the core, but they also held down the core when the mould was poured, as will be seen at *R, R, R, R* on the end view of flask. These four nuts are screwed into holes tapped into the end of the flask and the plates screwed down tightly, thereby making a firm, reliable rigging for the purpose intended.

Another point of interest is the plan by which the core was made. Ordinarily, a full core-box would be made, and this might be the cheapest plan were there many cores to make. But for the few wanted their construction by the use of sweeps was a saving of at least fifteen dollars. In making the core the core-plates were leveled and firmly set upon the oven carriage. The center of the plate was then found and a line drawn. The length of the core, from the end *F* to the neck *K*, was then laid off, the blocks *M* and *N* placed on, and after being set and marked around these blocks, were lifted, and about one inch thickness of core sand placed upon the plate. The core arbor was set upon this, and, after being centered and found to be otherwise correct, the blocks, *M* and *N*, were set on their marks and the core rammed up For forming the longitudinal straight portion of the core the straight sweep was used. For the taper longitudinal portion of the core the taper sweep was used. The dotted line on this sweep represents the straight portion of the core. The taper sweep was cut out, as represented, in order to clear the portion of the core formed by the straight sweep. The taper sweep could have been used half its length had there been another block like *N* placed at *H*. After being dried the halves were blacked and rolled over, after which a vent was filed along their centers. The top half of the core was then rolled back, and being hoisted by the four lifting hooks, it was lowered upon the bottom half and gently rubbed until a close joint was formed.

It might be well to state that the sweep and blocks were made about ⅛″ out of a true circle, being the largest in the direction of the vertical section. This is indicated by the difference between the vertical and horizontal measurements on the straight sweep, and was to allow for the core sagging and for rubbing down. Had this not been allowed for, the core would have been far from being a round one. Rubbing down makes a close joint, which assists in keeping the metal from getting into the joint vent of the core.

After being rubbed and found to be all right, the top half was hoisted and the joint brushed off and carefully spread with flour paste. It was then again lowered and the two halves bolted together, as shown in the longitudinal section.

Fig. 30 shows a section of cut tubes 3″ in diameter placed when the core was made. This is for the purpose of making a clean firm hole upon which to lay the washers, 31, for screwing down the bolts *W*.

The section, *A, B*, marked cope, shows the position of the chaplets around the core, and the longitudinal sectional plan of mould shows the number that were used for securing it lengthwise. The two lower chaplets were placed at the joint's surface in order to have about the same hold at the lower end as the print gave at the upper end.

When setting the nowel and cope chaplets the core was carefully calipered and the diameter of the mould measured. At every print the mould and core measurements were compared and thereby the exact thickness of metal obtained and the core placed in the center of the mould

The cope was then tried on, there being flour under the cope chaplets on the top of the core to see if they touched as they should to make a safe, reliable chapleted core. In closing the flask the only guides were the bottom spindle journal *P*, and feeling the joint at the top through the risers 33 and 34. When the cope was hoisted and everything found to be right, the iron joint was pasted and the cope lowered for good.

After being firmly secured with bolts and clamps the joint was carefully packed with wet loam, especially at the lower end, in order to prevent any run-out. The riser holes and pouring runner were stopped with waste to keep out dirt, and the flask was then hoisted upon end and placed in the pit.

The pit being only about 9 feet deep, it was necessary to build staging for the pouring basin and feeding head, and also to pour the mould, the basin support shown was made because of having to pour so high above the ground.

The nuts 35 and 36 screwed into tapped holes in the flask, and to assist them in holding up the basin scantling were placed, running from the outer edge of the plate on a slant to the flask. The ends of the scantlings come to the handles of the flask which are not shown. With the exception of the first defect mentioned the castings came sound and clean.

Electric Locomotive Headlight.

On our railroads where obstructions are often met with in the shape of stray animals, stray cars and delayed trains, any improvement in lighting which would illuminate the track for two or three hundred yards, would be the means of saving much life and property. When electric lighting first became popular, great hopes were founded on this method of illuminating the track. But all the attempts in this country to produce a successful electric headlight proved futile, principally through the jars and oscillations of the train destroying the delicate mechanism of the lamps.

According to a report recently received from the United States Consul General at Vienna, certain Austrian electrical engineers have entirely surmounted the obstacles in the way of using electricity for locomotive headlights. With an electric motor driven by an expenditure of three horse-power the light of the lamp, which was a special invention, was maintained with steady brilliance, unaffected by the vibrations inseparable from high speed. On a dark night when a fine rain was falling—the very worst kind of a night for seeing ahead—this headlight exerted an illuminating power that made objects appear distinct at a distance of 270 yards. By an automatic arrangement the lamp swung round in traversing a curve so as to shine on the track.

The presence of an illuminating power like this, would have averted some of the worst railroad accidents that have happened on our lines.

It is to be hoped that this improved form of headlight will soon be found chasing the dangers of darkness away from our unprotected railroads east and west, north and south. In no section is provision against accident sufficiently perfect to exempt it from the need of using a new safeguard.

President Garrett of the Baltimore & Ohio Railroad has ordered that employes of the road shall have a two weeks' vacation with passes over the line and no reduction of salaries. Employes will appreciate such liberality in a way that will operate to the company's advantage.

The United States Consul at Leeds, England, reports that our tariff is likely to prove disastrous to the woolen trade of that district. As the tendency of other European nations is to protect their own industries by imposing high duties on imports, the English manufacturers reposed fond hopes on the agitation against protection in America. They expected that the revision of our tariff would increase American demand for their goods, and they are intensely disappointed over the turn matters have taken. They find the revision leaves them worse off than they were before. Many mills were kept going on the expectation that their production could be shipped wholesale upon the American market

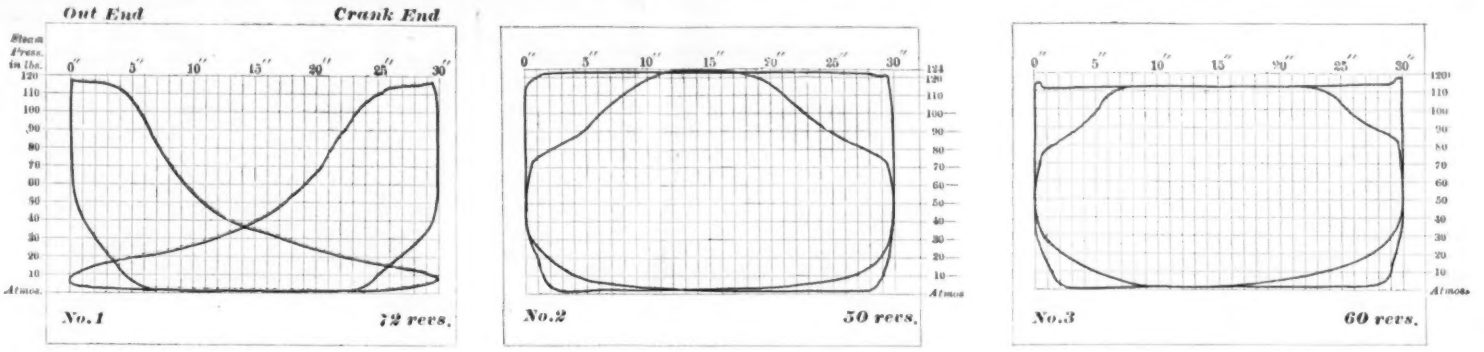
so soon as the tariff was revised, and the knocking out of this prop from under them has led to widespread stagnation of business. Manufacturers and operatives are now said to be coming to America in large numbers.

We regret to hear of trade depression in any country, but we can bear with greater fortitude to hear of it abroad than among our own operatives, especially in a case where increased prosperity abroad was going to entail poverty among American mill workers.

Performance of the Stevens Locomotive.

We have repeatedly drawn attention to the efforts of A. J. Stevens, General Master Mechanic of the Central Pacific Railroad, to obtain more work from the steam used in locomotive cylinders by a better distribution of the steam than what is possible with the link motion alone. In the AMERICAN MACHINIST of June 30 we illustrated the model of a new locomotive valve motion, invented by Mr. Stevens, which was exhibited in the Nathan & Dreyfus collection at the Exposition of Railway Appliances at Chicago. This model excited much interest among master mechanics and railroad men generally. The motion admits of any cut off, and holds the steam in the cylinder till near the end of the stroke irrespective of the point of cut off. That is, the Stevens motion makes a revolution of link practice where an early cut entails early release. The Stevens valve-motion was put on engine No. 48 of the Central Pacific Railroad, and the performance of the engine during the months of June and July in comparison with three link-motion locomotives is shown in the accompanying table. An analysis of the statement will show that engine No. 48 during the month of June made 77 per cent. of engine miles and 65 per cent. of loaded car miles in excess of the other engines to the ton of coal burned. During the month of July the excess was 67 and 43 per cent. respectively. This is what can be done by long expansion of steam, and we expect to see the system so developed that locomotives will approach stationary engines in point of economy.

The indicator diagrams, reduced to one half the scale of the originals, show the distribution of steam at short cut-off to be about the same as in good stationary engineering practice, the steam lines being very near the boiler pressure, and very little back pressure on the exhaust. The diagrams at longer cut-off also show the steam lines very nearly straight, and demonstrate the capacity of the cylinders for heavy work. It should be observed, in considering the diagrams, that the engine was made for freight service and not for speed.



Statement of miles run, cars hauled and fuel consumed by four engines hauling freight opposite each other between Oakland and Sacramento.

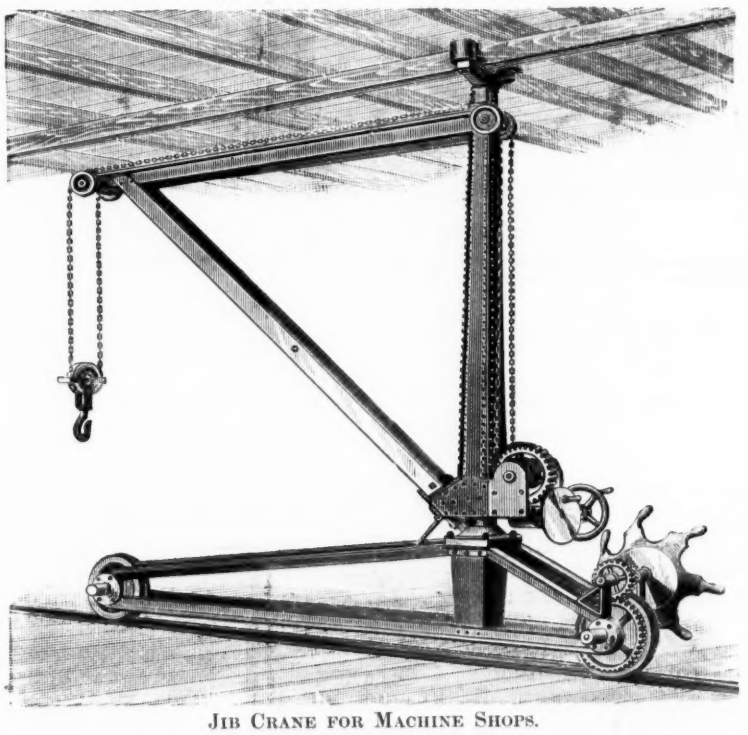
JUNE, 1883.

NO. OF ENGINE.	MAKER.	CYLINDERS.		DRIVERS.		WEIGHT.		MILEAGE.		FUEL CONSUMED.		MILES RUN TO ONE TON OF COAL.	
		Diam.	Stroke.	No.	Size.	Engine.	On drivers.	Engine.	Loaded cars.	Tons of coal.	Cords of wood.	Engine.	Loaded cars hauled.
34	Norris.....	17.	24	4	4'6"	65,250	40,200	2,738	102,570	113	4[2]	23.60	884
36	Rogers	17.	24	4	4'8"	72,100	43,200	2,590	69,709	89[2]	6[1]	27.70	745
48	Stevens.....	17.	30	4	4'6"	85,000	51,850	2,608	76,051	50	7[2]	47.42	1,382
186	C. P. R. R.....	17.	24	4	4'8"	74,000	49,400	2,715	82,181	89	4[2]	29.51	893

JULY, 1883

NO. OF ENGINE.	MAKER.	CYLINDERS.		DRIVERS.		WEIGHT.		MILEAGE.		FUEL CONSUMED.		MILES RUN TO ONE TON OF COAL.	
		Diam.	Stroke.	No.	Size.	Engine.	On drivers.	Engine.	Loaded cars.	Tons of coal.	Cords of wood.	Engine.	Loaded cars hauled.
34	Norris.....	17.	24	4	4'6"	65,250	40,200	2,806	91,501	116[1]	5	23.50	766
36	Rogers.....	17.	24	4	4'8"	72,100	43,200	2,592	71,992	87[2]	4[2]	28.64	795
48	Stevens.....	17.	30	4	4'6"	85,000	51,850	2,870	74,090	59[3]	6	45.01	1,162
186	C. P. R. R..	17.	24	4	4'8"	74,000	49,400	3,107	93,826	101[3]	5	29.57	893

Jib Crane for Machine Shops.



JIB CRANE FOR MACHINE SHOPS.

On this page is shown a cut of a crane designed by M. E. Hersey, manager of the foundry and machine department of the Harrisburg (Pa.) Car Manufacturing Company, for use in the machine shop. It is regarded in that establishment, so we are informed, as an indispensable tool, a favorite with the workmen and invaluable as a labor-saving machine.

The crane is constructed to handle weights from 1,000 to 1,500 lbs. to best advantage. The distance from center of mast to point of suspension is 8 ft. The hollow mast and jib revolve, making a complete circuit, turning freely on friction rollers, and covering a floor space of 16 ft. diameter. The base is made of two skeleton frames of 3" angle iron —total length 11 ft. The main flange wheels are 16" diameter. One is on line with point of suspension and will consequently prevent tilting when loaded. When the jib is at right angles to base of crane, girder on top, and guide-wheels on each side sustain the load It is provided with double hoisting-gear. On the center of drum is attached a worm-wheel with worm working in oil-box on bottom. On the worm shaft is a bevel wheel with handle for quick motion. At right angles to this is a countershaft with bevel pinion and hand-wheel for handling heavy weights. The large hand-wheel is to overcome inertia of load in traveling horizontally. When once started one man will push it as rapidly as a man can walk. The small latch locks jib and hollow mast to base.

The success of these cranes in their shops has led the company to make them to supply other shops.

According to *L'Electricien*, a report was made that Marcel Depres had succeeded in transmitting 60 per cent. of the mechanical efficiency of a motor by electricity from Miesbach to Munich, but it was afterwards found that the loss merely represented the loss of electricity. The net power transmitted available for industrial purposes, varied between 25 and 35 per cent. The conclusion arrived at appears to be, that in transmitting power by electricity any great distance, little more than a quarter of the power can be utilized.

Technical Education in Engineering.

The following are the salient points of an address on the above subject delivered before the Elswick Institute, England, by Thomas F. Daltry, an eminent engineer and technical instructor.

* * * * * *

Technical education is advocated as one of the antidotes to the foreign competition with our manufactures, of which we constantly hear. I fail to see that should be the case to the extent insisted upon. In machine-making this competition is only small. When it exists to the extent of being felt, it is in the products (not machines) made by machinery, and then because, as a rule, the foreign operative works longer and lives cheaper than is happily the case with workmen in England. In any case, foreign rivalry can be met by producing cheaper and better articles, and the question is, what system is the best for training engineers, in order that, as regards their part of our productions, they can achieve these results, and who are the men that should be educated? In reply to this, I contend that the system that has produced the mechanical engineers of England and America is vastly to be preferred to the Polytechnic Schools and the artificial systems prevailing in many parts of the Continent. I say this because results support it, but at the same time I think improvement is possible with us. The best knowledge that can be gained by a mechanical engineer is what he teaches himself, and gathers by observation and experience in workshops and drawing offices. This will, perhaps, be granted by most people, with the stipulation that a thoroughly scientific knowledge should be added; but really for designing and constructing the great bulk of mechanical work very little pure science is required, and certainly not more than any lad could learn in a couple of sessions at the ordinary science classes. Of course problems sometimes present themselves to an engineer, the investigation of which requires a proficiency in higher mathematics, which can only be acquired by years of study, and retained by constant practice. In the general run of mechanical work, however, such cases occur very seldom indeed. In order to deduce certain formulæ and rules used by engineers in designing, an extensive knowledge of mathematics and theoretical mechanics is necessary, but it is by no means imperative that the user of these rules should obtain sufficient skill in the higher mathematics to understand how they are obtained. Given expertness in arithmetic and a knowledge of elementary algebra were decided the application of a formula is most frequently very easy, whilst its deduction is very often the reverse. And when we look at what the engineers at the beginning of this century accomplished, almost before mathematicians took any notice of them, it is not a bold thing to say that mechanical engineering would not be much worse off at the present time if algebra and trigonometry had no existence. Watt made pumping engines which, for economical working, have not been surpassed, although the mechanical art in his time was so backward, and the facilities for constructing so few, the lathe being almost the only machine available. Having accomplished what he did, numberless scientific men have since descanted upon it, but I cannot see in what way their disquisitions has affected the modern practice in engine building. The pattern-maker at Stephenson's who invented the link motion did vastly more for engineering than the worthy Swiss professor who, in a learned book, has since told us all about it. Whilst all will acknowledge that it is advantageous—and more power to his elbow —for an engineer to be a good mathematician, it is questionable whether the time and study spent to become one could not, from the

paying point of view, be better employed in other directions in his profession. I think also that the habit of mind acquired by lengthened study of science is not the best for an engineer. I also maintain the same for the other subject usually taught in the science classes of mechanics' institutes. Engineering now covers a vast field, and is daily becoming more specialized, and if a young man wants to get on, it will require hard work and all his time to acquaint himself with what is being done, even in his own special department, as, for example, in engine work. It is better for him, in his own and his employer's behalf, to study what others are doing, and endeavor to beat them by cheapening this part or improving that, than to be able to comprehend all the thermodynamics in Rankine's works.

* * * * * * * *

If we admit—and only for the sake of argument I will do—that on account of foreign competition in the mechanical trades it behooves us to put our house in order, and that, in conjunction with other ways of meeting it, we must have better engineers, both masters and men, the question is how are we to get them? I say by systematically searching out, encouraging, and duly rewarding, pecuniarily or by promotion, the mass of latent ability that I have ample evidence exists amongst working mechanics, men and lads.

I advocate that every lad intended to be a mechanical engineer should commence his career in the workshop at an early ago, say fourteen or fifteen, with, of course, the best education his parents can afford to give him. He should be given to understand that there are prizes worth working for, and that according to his industry and ability he will infallibly be rewarded, and that mediocrity will have no undeserved preference over him. He should clearly, too, see that each of his many competitors understand the same thing. I will now assume a lad has been apprenticed in the usual course. I may remark in passing that I think it would be unfortunate, as the tendency seems to be to dispense with this old-fashioned and well-tried system which has produced so many capital engineers. The inducement held out to him should be the drawing office, which should always be recruited from amongst the superior lads in the workshops. The task of selecting the most deserving, although difficult, could, I think, be got over by periodical examinations in different classes of workmanship in the shops, much upon the same plan as were held at one time in connection with the Whitworth scholarships. Their skill in handicraft should not be a sufficient reason to advance a lad to the drawing office. He may have a good hand and a poor head, and, therefore, to obtain some gauge of his mental capacity and ability to work, he should be required to attend science classes in the evenings, and by preference in the subjects most closely allied to engineering, to be precise, say in descriptive geometry, mechanical drawing, theoretical mechanics, applied mechanics and steam. Others may be added, but only as features of a more liberal education. The recorded results of scientific and practical examinations spread over three or four years will enable the employer or his manager, by consultation with the foremen, to select, with little trouble, the young man most deserving of promotion to the drawing office. Installed here he commences a career in which the knowledge he has picked up by observation in the workshops will be of the greatest value to both his employer and himself, and the scientific knowledge he has obtained at the science classes will at the same time be amply sufficient for his requirements in his new avocation He should, now his usual work being finished, devote his attention to informing himself of what is being done in his own branch of engineering He should let nothing escape, and everything novel he sees, even if in a minute detail, he should get to the bottom of It is now that his powers of observation, which he has unconsciously trained and strengthened in the shops, will be of the greatest use to him.

The engineer himself, like his articles, should be produced under commercial conditions, and should live in an atmosphere where the smell of oil or tracing paper is never absent. It is absurd to try to turn out good men like buttons on a card, and the greatest educator should be the man himself. In the drawing office he has a better chance of coming under the observation of his manager or his employer, and his development can be observed and stimulated in the direction in which it is most marked. One man will exhibit great ability as a designer and contriver, showing ingenuity and resource. Another man may be a good detailer, having an innate ability to hit the proportions and draw the work so that it may be cheaply produced. Here workshop experience is almost indispensable. Another man may be an indifferent draughtsman, but having a good address and a pushing disposition, he would make a good outside representative for the concern. The engineer *par excellence*, capable of holding the highest positions, is, like a poet, born, not made.

I do not underrate the utility of technical education as now carried out in certain districts for special trades well adapted to it. But to me technical education, so called, in mechanical engineering, appears absurd. A knowledge of several sciences is not required by nineteen-twentieths of the general run of engineers, and for their work they are better without the scientific habit of mind. Utilize science classes as the best means of estimating the mental capacity of apprentices and more of liberally educating them. Let the engineer whose taste lies in that way investigate, if he will, from the scientific standpoint the multitude of problems in engineering that lend themselves to this treatment. He is making bullets, some of which I freely admit it may be to the advantage of his more commercial brothers to fire, but their value to mechanical engineers is most trifling. I venture to say that three-quarters the value of the machines exported have had no more calculation bestowed upon them than working out a few wheel speeds. Some of these machines are of the most complicated character, the outcome of a legion of inventive minds. Invention and improvement is as vigorous now as ever it was, and shortly it will be vastly increased. The inventive faculty is by no means so rare as is commonly supposed, but I don't think it will be stimulated by class teaching or book reading.

ADJUSTABLE CHUCK. FIG. 2.

New Stocks and Dies and Drill Chuck.

The accompanying engravings represent an adjustable stock and dies for pipe-work, a pipe guide, and a drill chuck for holding taper and straight-shanked drills, all being the invention of James H. Lancaster, president of the Lancaster Manufacturing Company, 36 Dey street, New York.

The adjustable stock and dies is a very compact and simply-constructed tool Two of the dies fit into immovable seats, while the third can be advanced to or withdrawn from the cutting edge by turning the lever of the stock, to which it is attached by a ball joint. The under face of the dies are slightly beveled, which is said to facilitate the work of cutting when the dies are taking hold of the pipe.

The adjustable pipe guide, Fig. 2, is a rig which can be fastened on the stock to keep the pipe in a central position while the thread is being cut. It consists of a short tube that encircles the pipe. Through this tube three longitudinal slots are cut, into which elliptical wedges fit that can be pressed inward to grasp the pipe by screwing up on a threaded collar that passes over them.

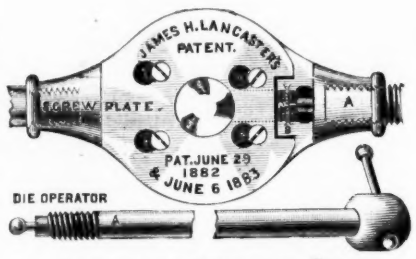
The adjustable chuck for taper or straight-shanked drills is an ingenious device for the purpose it is designed to fill. It consists of twelve dog-leg-shaped pieces of steel, built up round a center and formed into a continuous connection by means of toggle joints. By turning the stem, shown at *A*, a worm, acting on the slotted base of the chuck, closes the jointed pieces towards the center, and they grasp anything that may be placed there regardless of its shape.

The Denver *Journal of Commerce* declares that pig iron can be produced at fifteen dollars or less per ton in Colorado. The iron manufacturers of that State are virtually exempt from foreign competition, at this figure, whether the free traders succeed in breaking down the tariff or not.

The following circular has been issued by the secretary of the American Society of Mechanical Engineers, F. R. Hutton, 15 Cortlandt street, New York:

"The annual meeting of the society will be held in New York City during the week ending November 3d. Detailed programmes will be sent out later. Members who have papers to present at this meeting are requested to send the titles to the secretary, and to furnish him their manuscripts as early as possible, that they may be put in type in advance of the meeting. Drawings for reproduction should be in black and white, and should be forwarded considerably before the date of the meeting."

As the society has grown to large proportions, there will probably be quite a number of papers presented. Short, practical papers will undoubtedly be received with most favor. As the membership increases, long, abstruse papers will be, more than ever, out of place.

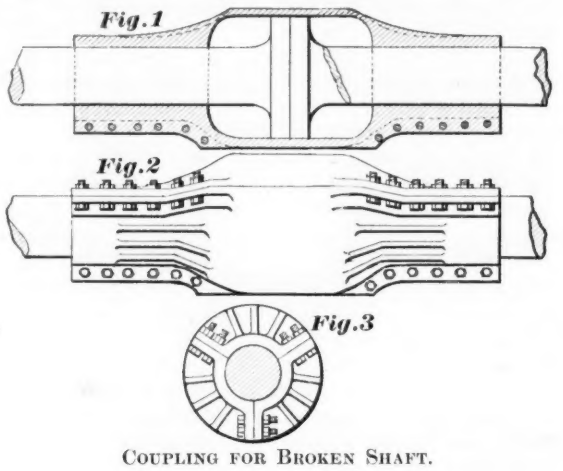


ADJUSTABLE STOCK AND DIES.

Couplings for Broken Shafts.

A ship at sea with a broken propeller shaft is often in a most helpless condition, for many have not sufficient sail to keep them from falling into the trough of the waves, and very few will steer when the screw is being dragged through the water. As a means of avoiding the danger resulting from a broken shaft, Mr. Archibald Thomson, superintendent engineer of the Union Steamship Company, has brought out a novel form of coupling, which we illustrate in the accompanying engravings. As will be seen, it is made in three segments bolted together, and so designed that while the two end portions obtain a firm grip of the shaft, the middle part is of sufficient diameter to contain a shaft coupling, or the thrust collars, or any jagged and uneven part resulting from the fracture.

It is notorious that shafts generally break in most inconvenient places, where it is impossible to apply any form of hastily contrived coupling, such as can be produced on board ship; but with Mr. Thomson's arrangement there is scarcely any form of break which cannot be repaired. Should the shaft fail in a bearing, the plummer block is removed, and the weight carried upon an extemporized support placed under the central turned portion of the coupling. No keys are required, as the bolts give a powerful grip on the shaft; and as the segments are of cast steel, there is no danger of the flanges breaking away.



COUPLING FOR BROKEN SHAFT.

Another and perhaps more important use of the coupling is for relieving the strain in any part of a shaft in which a flaw may develop itself while at sea, and hence, by its timely employment, dangerous breakdowns may be avoided.—*Engineering.*

The Ironmonger of September 1st says: "The builders of engines in Leeds are all very busy, but it is principally on export account. One of the principal firms in Leeds is continually turning out locomotives, and all sorts of portable railway plant, to such an extent that overtime is necessitated. There appears every likelihood of more orders for engines suitable for plantation purposes abroad coming in to a large extent, and it is well ascertained that in these transactions prices have been more satisfactory than they were when similar orders were given out twelve months ago."

In Georgia the barbecue is a recognized and important factor in the promotion of new railway enterprises. A well-roasted three-year old steer with speeches and proper preventives of thirst are said to form an almost irresistible combination.—*Railway Age.*

A novel sewing machine motor, says the *Sewing Machine News*, has been invented by a Jerseyman. The motor is intended to be operated by the foot or by the act of rocking. A rocking platform is provided for the operator to rest his feet upon while he sits in a chair, the hinder part of which is attached to the platform, which platform is pivoted to an upright lever through which the power is transmitted. The act of leaning back and forward by the operator oscillates the chair, which transmits motion and power to the upright lever. The upper end of the vertical lever is provided with a double rack and pinion, which is driven by the power conveyed by the foot-rest or by the rocking movement of the operator, as the case may be.

Petroleum as a fuel has lately been introduced in the Norway Iron Works at Boston for the use of scrap-heating furnaces, in which the two-ton charges are put through in 25 or 30 minutes. This heating furnace has regenerators at both ends, and the work that it does is pronounced satisfactory. Where petroleum can be used for metallurgical purposes cheaply enough to compete with coal, it possesses the advantage of containing no impurities that will contaminate the iron. Its freedom from sulphur ought to be the means of producing a better grade of iron than what comes from metal melted by the ordinary run of coal.

The Acme Bolt Cutter.

We illustrate with this some of the more important details of the "Acme" bolt cutter, the invention of M. D. Luehrs, and manufactured at the Novelty Iron Works, Cleveland, O.

In the illustrations Fig. 1 is a view in longitudinal vertical section of the head, showing the manner in which the die-ring operates the dies.

Fig. 2 is a plan view of the face of head, in which is the barrel, *p* are thread-cutting dies which are fitted in radial slots cut in the face of the barrel, and are held in place by means of a face-plate *K*. *B* is a die-ring which surrounds the barrel and is adapted to slide upon it.

The upper end or caps of the dies which are made T-shaped, engage with T-shaped slots cut in the die-ring, as shown in Fig. 2.

The upper ends or caps on dies are made inclined, as are also the bottom walls of the slots.

Thus, it will be seen that as the die-ring is forced outward it will act to force the dies toward the center of the barrel, and as the die-ring is drawn back it will act to draw the dies from the center of the barrel. The projections on each side of caps on dies engage with the walls of the recesses of the slots in die-ring. *D* is a curved rocking lever which is pivoted in a recess cut in the other surface of the barrel. (See Figs. 3 and 4.) One arm of the lever *D* is attached to the die-ring *B* by means of links *E*, and an adjustable stud is connected to the die-ring by means of adjusting screw *I*, which is provided with two screws having a different pitch, the coarser screw engaging in the die-ring, and the finer engaging in the stud. By thus uniting the stud and die-ring a finer and more positive adjustment can be made between the two, and prevents lost motion between the parts. The object of adjusting the stud is to lengthen or shorten the distance between the die-ring and arm of the lever which acts to regulate the distance to which the dies shall travel toward or from the center of barrel.

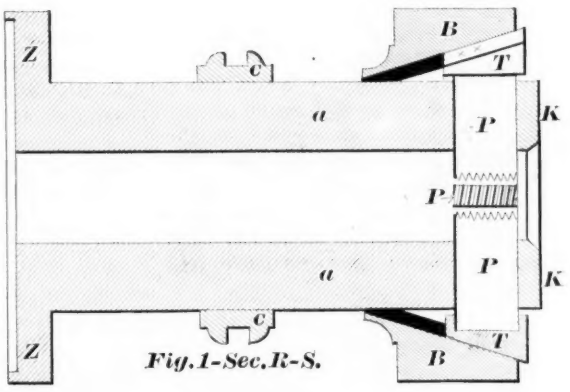


Fig. 1-Sec. R-S.

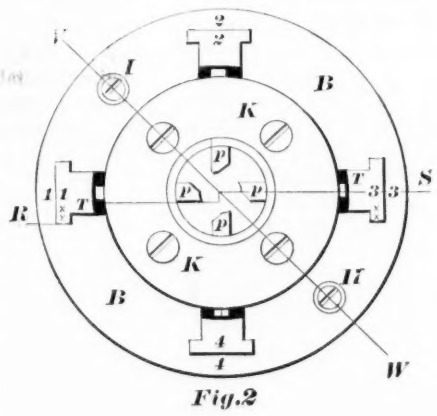


Fig. 2

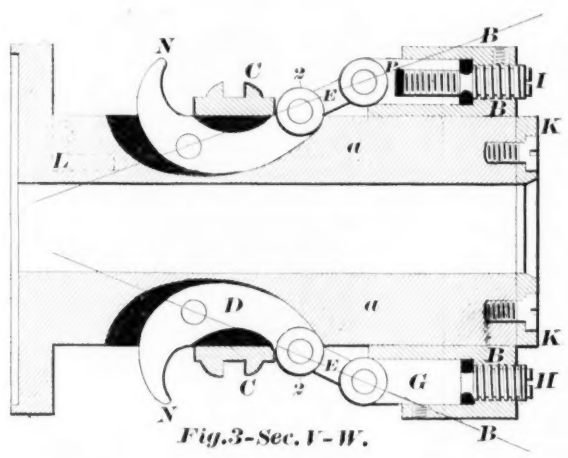


Fig. 3-Sec. V-W.

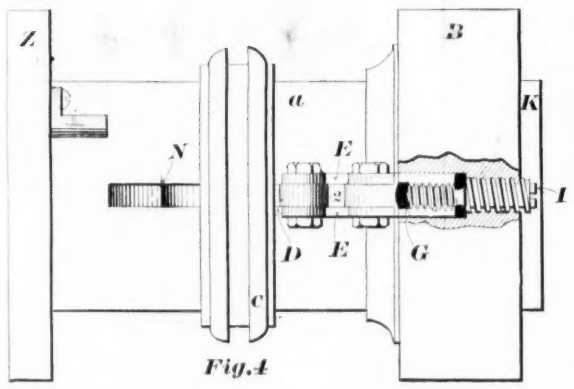


Fig. 4

The rear arm of lever *D* is curved upward, as shown in Fig. 3, and a clutch-ring, *C*, which rests between the two arms of the lever, acts, when it is drawn back, to depress the arm *N* of lever *D*, which in turn acts to elevate the arm *Q*, and also to draw this arm backward and with it the die-ring which is connected to it by the links and stud. This acts to open the dies, and as will be readily seen by reversing the motion of the clutch-ring. The die-ring is forced forward and the dies closed.

The equalizing screw *H* is not connected to stud *G*, but only abuts against it, as shown in Fig. 3, which obviates the necessity of removing each of the screws at the same time and in the same direction to prevent straining or canting of the die-ring. It is not necessary to connect but one of the studs to the die-ring, as the inclines on the dies or caps and in the upper part of the stud always tend to force the die-ring back. The lever, links and studs form a toggle lock, as will be seen in Fig. 3, and the greater the strain backward on the die-rings the firmer is the lock.

All wearing parts are made of tempered steel by Jigs & Sanges, and are interchangeable.

LETTERS FROM PRACTICAL MEN.

Disastrous Boiler Explosion.

Editor American Machinist:

A terrible explosion occurred at the Shawnee Mills in this city on Sept. 3. The writer was one of hundreds to visit the scene of the accident next morning. The boiler was the ordinary return tubular 40″x16′ and it was made of ¼″ iron and had been in use 18 months. During that time the boilers were used constantly day and night. The explosion was tremendously violent, tearing the boiler to fragments, and the steam drum was found 500 feet from the mill, and to reach the point where it lay it had passed clear over the top of the mill, which is five storeys high. The writer examined the boiler sheets and found that some of the under sheets near the mud drum were eaten almost through by some unknown cause, so that some parts were not thicker than an old barrel hoop. He does not think they were capable of standing a pressure of five pounds with safety, although the boilers were worked at ninety pounds.

The mill had been shut down some two or three times the week before the disaster, to have the boilers repaired in places where leaks had occurred, and three or four flues were taken out and replaced with new ones. Having heard of the peculiar action of the water on these flues, the writer examined them. The flues were full of small holes near the back ends and had the appearance of a block of wood eaten full of holes by worms. In some places were holes that one could almost put a finger through. Since the explosion I found that the sheets under these damaged flues were badly pitted, showing bad corrosion, either from impure water or from solvents used to remove scale. These boilers, like many others in this part of the country, possessed no means of internal inspection. The sheets of the exploded boiler were undoubtedly wholly unfit to stand the work they were required to do. But apart from this weakness, there was every appearance that the sheets had been subjected to overheating, which no doubt was the immediate cause of the catastrophe.

By the addition of new machinery in the mill the boilers had got increased service to perform and they were overtaxed. Thus the boilers were being taxed beyond their capacity, and yet they received no inspection to ascertain their condition. I think that laws should be passed requiring proper inspection of boilers by competent men. The boilers in our crowded towns out here are like powder magazines, often stowed away where they will do the greatest harm when an explosion takes place, which is generally the first indication that they are in bad order.

When boiler insurance companies are able to carry on a system of inspection that makes boilers practically safe, there is no reason why good State laws should not guarantee equal security.

Topeka, Kansas. D. W. DOZIER.

Getting Along in the Shop.

Editor American Machinist:

In issue of August 11, D. K. tells how he did *not* get along as foreman for Mr. Brown. A successful engagement in the shop depends very much upon whether we try to make the best of things, having a real desire to get along smoothly and pleasantly, or on the contrary assume the aggressive and demand our full rights and benefits in a loud voice—not caring whether we stay or not—in the "plenty of other shops" style.

It is evident that Brown's folly in proclaiming his own abilities was well noted by D. K., and that he determined (perhaps unconsciously) to give Brown a "recking," and he did it, too; but at the expense of his situation.

If, when Brown had told him that it was not right to do that work, he had quietly had it taken out of the lathe, it is more than likely that the matter would have been reconsidered and the work allowed to proceed—particularly if D. K. had been good-natured about it.

Employers are but human, and they will bear a little management as well as other people do, but it must be done good-naturedly or not at all, for employers are and must be sovereign as to whom they will *not* employ.

I was once boring locomotive main boxes, and while the cut was going through I would sometimes take a seat on the tool-board. I had been in the shop but a short time, and had never seen the chief manager, Mr. Fairbairn, although I had heard of him as a very rigid and severe disciplinarian, just the kind of a man who did not like to see a workman with his attention unoccupied with his work.

One day a military-looking man came in, and after glancing about in a quick energetic way, walked up behind my lathe, examined the work, and then came round in front of me as I sat there whittling, and said:

"Don't you need a cushion to sit on?"

I looked up with a smile and said quite eagerly: "Why, yes; but my salary will not admit of it."

He laughed heartily and started for the office, laughing as he went; and that man was Mr. Fairbairn, the agent of the works, and the terror of delinquent workmen. I worked for him several years afterward, and I could not ask for a better employer.

F. J. MASTEN.

Progress of the Joy Valve-Gear.

Editor American Machinist:

I note that one of your correspondents, signing himself a "Master Mechanic," after an invidious and unjust comment on my valve-gear by which his utter ignorance of it is made apparent, goes on to state that "it is not rapidly adopted in England."

Although I have already published a statement on this point showing that it is being taken up in Europe as fast as is possible for a radical improvement involving so entire an alteration of the system of the steam engine, yet as proof of the solid basis of this advance I further add that where railway companies here have commenced building my gear, they have continued it by ten engines at a time.

And marine engine builders after having built up to 2,500-horse power in one pair have followed by building up to 5,000-horse power, and of those there are a number of instances.

Your violent correspondent may make what he likes of this, but I merely mention a few facts out of a great many. I suggest that the next time he rushes into print, if he have any lingering regard for truth and fairness, he will previously take the trouble to inform himself of his facts instead of jumping in with reckless statements which can only deceive and humbug those who read them.

DAVID JOY,
London, Eng.

The Grossbeck & Wright Spark Arrester Company, of New York, have obtained a patent for a boiler which contains a combustion chamber located within the tubular portion of the boiler. Between the fire box and the combustion chamber there is a set of short tubes, then the main tubes reach from the combustion chamber to the smoke box. Means are provided for supplying fresh air to the combustion chamber, so that the products of the coal may be properly consumed. Should leaks start in the tubes at the combustion chamber it would be an interesting operation to caulk them up, and the plugging of a bursted tube would open a new field to human ingenuity.

An exhaustive inquiry was instituted by the British Government into the cause of the accident at the launching of the ship *Daphne* on the Clyde, where the ship capsized and drowned a great many people. Sir Edward Reed, one of the ablest naval architects in Europe, was employed to conduct the inquiry, and his elaborate report shows that want of stability in the vessel was the cause of the accident.

His report has given startling disclosures as to the unstable condition of many sea-going vessels, and the inference is that many mysterious disappearances of ships at sea might be accounted for by supposing that they had turned over because they were top-heavy. No correct method of ascertaining the stability of ships has been practiced among the ordinary run of naval architects. If the report made by Sir Edward Reed attracts greater attention to this subject than it has hitherto received, the *Daphne* disaster may be the means of preventing the loss of many lives.

The Cincinnati Industrial Exposition, the Exhibition of the New England Manufacturers and Mechanics Institute at Boston, the Inter-State Exhibition at Chicago, and Pittsburgh Industrial Exposition, are all in full blast and are attracting crowds of visitors.

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NEW YORK, SEPTEMBER 29, 1883.

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Free Smoke Consuming Appliances.

One of the most common subjects of patents to-day in this country is the consumption of smoke. This arises from a growing desire throughout the various States to restrain the volumes of smoke that have usually been a feature of all factories, steamers, locomotives and furnaces. It is dawning upon the public mind, that all this smoke is not so much an unavoidable necessity as the result of carelessness. The fiat has gone forth that the smoke nuisance must go, and inventors are preparing to reap a harvest from smoke-consuming devices.

Most of the inventions aim to consume smoke by currents of air injected on the fire by means of steam jets. The cause of smoke is usually defective combustion from want of the proper admixture of air with the burning gases. Any device that will distribute air throughout the solid and gaseous portions of the fire in the proper quantity will prevent smoke. It is an easy enough matter to supply plenty of air, but regulating the exact quantity needed for complete combustion of the hydro-carbon gases without lowering the temperature of the furnace is a difficult problem. Should the quantity of air admitted be too small, smoke will be produced; should the air be much in excess of the supply needed for effecting the chemical combination called combustion, the gases will be cooled down below their natural temperature and loss of heat will result. This means waste of coal.

No automatic arrangement can be made to supply just the required quantity of air to a furnace, because the volume of air needed is constantly varying. The urgent call for mechanical methods of consuming smoke generally comes from those who employ inferior firemen, who habitually violate all the laws relating to combustion in the way they handle the fire. A good fireman, with a common furnace, is a better smoke consumer and coal saver than the best patent appliance in the hands of a poor fireman. Conveniences for regulating the air supply will help a good fireman to do his work economically, and there is no difficulty in consuming the smoke; but the patentee who comes round with a smoke-consumer, and says it will effect a wonderful saving of coal, is deceiving himself and trying to deceive his customer. Smoke-consuming furnaces are used on nearly all furnaces in Europe that burn bituminous coal. Exhaustive experiments have been made to ascertain the economical effect of the various smoke-consuming devices, and it was uniformly found that they did not save coal. Our attempts to systematically prevent smoke are in their infancy; in Europe the subject is about exhausted. Such a multitude of patents relating to every conceivable method of smoke-consuming and prevention has been taken out in Europe, that it is surprising how any of our inventors reach a new peg about a furnace to hang a patent upon.

The method of injecting air into furnaces by means of steam jets was patented in Britain a great many years ago, and the patents have all expired. Any person can use that method without paying patent royalties. The numerous steam-jet smoke consuming patents that have been secured in this country lately, have no control of the jet but merely of some kink about its application. None of them equal the expired patent of injecting air through hollow stay-bolts, and that any boiler user can apply without let or hinderance.

Soda for Steam Boilers.

Why will owners of steam boilers buy and use patent nostrums, placed upon the market under the name of "boiler scale preventatives," without knowing what they contain or how much injury they are likely to cause? It is an easy matter to weaken the sheets of a boiler by putting a deleterious substance in the water, so much as to render the boiler dangerous. Many of the compounds sold to prevent and remove scale will certainly destroy a boiler if they are used persistently. Often it is necessary to use something to prevent scale from forming. The ordinary soda of commerce is almost universally used for this purpose in England, and is very largely in the United States. It is the opinion of some of the best engineers that nothing is superior to soda to prevent scale. Wherever soda causes foaming it should not be used, but it can be used to advantage in many situations where it has never been tried.

Work for Rolling Mills.

Since many of the bridges on most of our older railroads were built, there has been a great increase in the weight of rolling stock, the result being that such bridges are too weak for ordinary business. Comparative safety is secured on structures of this kind by moving the trains over at a slow rate of speed, thereby avoiding the violent blow which a heavy locomotive imparts when it bounds upon a bridge at a high velocity. Most travelers have remarked the tender care bestowed upon certain bridges on many of our best-managed railroads. This solicitude to avoid plunging through a weak old bridge is very commendable, but we think it would be more enterprising to build new bridges that would be capable of withstanding the calls of ordinary traffic. Where a train slows up to crawl over a bridge, the action invites all the passengers to note the fact that the structure is a weak link in the line of travel. People do not enjoy the excitement of passing over a giddy-placed span which is liable to crumble under the weight of a train. For this reason it would probably pay railroad companies to renew their old bridges, even though there appears to be no immediate prospect of a heavy bill for damages from an accident after the Ashtabula style.

Workmen Owning Houses.

In giving testimony before the Senate Committee on Labor and Education, John Roach dwelt strongly upon the importance to workmen of owning their own dwelling-houses. He thought there is no reason whatever why every industrious workman should not own his own house.

There are two sides to this question, however. It is, no doubt, very desirable to be possessed of a house without a mortgage upon it, but occasions are numerous where the thrifty workman, whose whole property consists of his house, wishes heartily that he had its value in cash with which to start business on his own account, or in easily portable property with which to move to some other locality. It is not easy to turn houses and lots into cash, at their real value, upon short notice. In large cities (with the exception of Philadelphia) neat and comfortable houses are almost beyond the means of average workmen to possess. We do not call possession the holding of a title-deed subject to a mortgage of three-fourths its market value; that is merely occupancy.

In small towns, where land and houses are comparatively cheap, and where most of the workmen are dependent upon one—or at most three or four establishments for employment, the artisan who has a bank account of $1,000 and pays rent for his home has a certain independence over the one who lives in his own house valued at $1,000. When business gets dull in that town and the alternative is either discharge or the acceptance of lower wages, the former workman can, figuratively speaking, fold his tent and steal away to fresh fields and pastures new, taking his savings with him. The latter is confronted with the problem of disposing of his house, either wholly or for a limited time, before going elsewhere. Very likely, at such a time, more parties wish to sell or rent their houses than are desirous of buying or renting. The result generally is that workmen who own houses stay in them and take lower wages. It is well known that in a small town of this kind, where a large portion of the workmen own the dwellings they occupy, a reduction of wages will be much more readily accepted than where house ownership among the workmen is rare.

No universal rule, however, can be applied. A workman should understand that when he buys a house in a town he assumes part of the public responsibilities of that town. In a well-governed town this will not be a burden, but there are cases where it becomes a troublesome one. Within forty minutes' ride of this office, in either of two directions, a virtually bankrupt city may be reached. These towns are mortgaged municipally for the greater part of the value of the property within their limits. Many workmen unfortunately invested their savings in houses in these cities some years ago, thinking very little about their responsibility in a public sense Too late they wished they had weighed these matters before purchasing.

The manufacturing corporations of Lowell, Mass., recently built an ambulance for use in conveying sick or injured persons to the Lowell hospital. In view of the frequency of accidents on the Long Island Railroad, we suggest that a few ambulances would be a desirable addition to the equipment of that road.

Jay Gould, the great railroad magnate, recently testified before the Senate Committee on Labor that his occupation, when a boy, was to milk and care for twenty cows on his father's farm. Then it was that he learned to water stock, and it is a curious feature of his career that he has kept right on watering stock quite regularly ever since.

Responsibility for a Boiler Explosion.

We have received two letters from practical men in Topeka, Kan., giving an account of a fatal boiler explosion that occurred there on September 3, killing one man and seriously injuring several others. We publish the shorter of the letters, which covers all the salient points. The other writer has evidently gone to considerable trouble to obtain the facts of the case, for he gives numerous sketches showing the shattered condition of the sheets But as boiler explosions are unfortunately far too common, our readers hardly take interest enough in an ordinary case of this kind to warrant us in reproducing the sketches, especially as in this case they indicate nothing as to why the explosion occurred.

From what we have learned about the boiler from the letters referred to, and from the testimony given at the coroner's inquest, and facts published in local papers, there is no difficulty in understanding why it exploded. But the astounding ignorance displayed by the parties responsible for the accident regarding the power of high-pressed steam, and the danger of a worthless corroded boiler, is really lamentable. Undeniable evidence was given that the sheets of the exploded boiler were badly corroded, and some repairs had just been done to a spot that was worn through. One reporter describes parts of the boiler as being no thicker than a case knife. Yet "experts," who were called to testify as to the cause of the accident, gravely asserted that a boiler could not explode through weakness; that low water must be the only cause for such an accident. Men who talk such stuff are dangerously pretentious fools.

The engineer testified that he knew the boiler was worn out in some places, but he did not expect it to give out in such a violent way, and he thought that low water alone could have made it go off so unceremoniously. The second engineer, who was in charge at the time the boiler went up, was reputed to be perfectly competent and had been in the place six months, which covered all his experience with boilers. He was killed, and the survivors were able to assert, without authoritative contradiction, that the boiler was so short of water that the sheets were burned. But they did not seem to think that any blame was to be attached to an engineer for letting water get low if he was deceived by a water-glass getting choked up.

These boilers were evidently overworked, and they got worn out before their time by

bad water, or careless, perhaps incompetent, management. It is getting beside the question to call for a better system of boiler inspection. No inspection will be satisfactory unless the owner of a worn-out boiler understands his responsibility for its safety, and is likely to receive justice by being sent to the State prison when it goes to pieces, and becomes an instrument in committing wholesale murder.

Steamboat-Boiler Covering an Element of Danger.

Speaking of the *Riverdale* disaster, the first engineer of a large and popular river steamboat that carries thousands of passengers during the Summer season, recently expressed himself forcibly, not only against the custom of setting boilers so low in a boat, and otherwise so circumscribed, that they cannot be come at for examination, but as well against covering boilers according to present practice, so that the shell, and generally the larger part of the leg, cannot be seen. He emphasized his strictures on the latter practice by relating his own experience that morning—an experience not calculated to be particularly reassuring. In looking over his boilers he saw evidence of a leak in the presence of a small quantity of salt on the covering, and, digging through the felting and following up the "lead" for some distance, he came to a body of salt covering several inches of the shell to a considerable depth. Removing this, he *thrust his knife through the iron.* In cutting away for a patch the thin, or corroded, area was found tolerably well defined, ending almost abruptly in iron of substantially the original thickness. His argument is that without the covering a slight leak will be at once detected, and remedied before any particular harm is done; but that with the covering it is generally impossible to detect it for some time, and that when it does show itself outside the covering it is often found that the iron is eaten away for quite a distance around the leak, frequently so as to leave the boiler in a dangerous condition. This is the opinion (not the theory) of an observing engineer of many years' experience in steamboating, and carries weight accordingly. Stay-bolts may break, as the engineer referred to justly remarks, and a knowledge of the fact be entirely beyond the observation of the engineer for weeks. With a small leak, especially in a part of a boiler where circulation is sluggish, and in a boiler where more or less salt water is used, salt will deposit around it very rapidly, and the iron is likely to be soon dangerously corroded. If the boilers of steamboats can be satisfactorily covered so that the sections can be readily removed for inspection of every part, then the saving of fuel effected by that means is an important consideration; but if the covering is an element of danger—even a very small one—it should not be permitted.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(310) G. W. L., Brooklyn, N. Y., asks: How shall I brown a large number of pieces, like the sights of guns? *A.*—There are several ways of doing this. One is to heat them in sand, in an iron box exposed to the fire; another, to use charcoal instead of sand. 2. What oil is best to use for a gun? *A.*—Pure sweet oil is good.

(311) Inquisitive, ——, Ark., asks: 1. How can I construct a sand blast for engraving on glass? *A.*—You will be able to form an idea of such an apparatus by an inspection of the device for sharpening files shown in the AMERICAN MACHINIST of September 17, 1881. You will be quite likely to infringe patents if you manufacture something for the purpose. 2. How shall I mix white paint for steam pipes? *A.*—We think you can buy asbestos liquid paint that will answer your purpose.

(312) R. S., Petersburg, Va., asks: What is the rule for determining the distance between the grate-bars and the shell of a boiler? *A.*—There is no rule, and but little or no uniformity. In practice the distance varies from 18"—sometimes even less—to 42". The tendency late years has been to increase the distance, and from 24" to 30" is perhaps a fair average of present practice.

(313) R. B. H, New York, asks: 1. How shall I make a paint for my boiler front, that will dry quickly? *A.*—Pulverize asphaltum and dissolve as much as you can in spirits of turpentine, at a gentle heat. 2. What can I use for cleaning brass? *A.*—Make a paste of 2 ounces rottenstone, ½ ounce oxalic acid, ¾ ounce sweet oil, and turpentine enough to make it pliable. Apply with a piece of waste.

(314) E. B., Hyde Park, Mass., asks: Will you please tell me which way an engine lathe should set in a shop; that is, should the workman face the window or not? *A.*—This is a matter of opinion. Our opinion is that the light should come to the lathe over the shoulder of the workman; in other words, that he should stand with his back to the window.

(315) W. W., Springfield, Mass., writes: 1. I have a small engine 1⅛"x2", steam ports ⅛"x¾", exhaust port ¼"x¾", steam pipe ¼", exhaust pipe ⅜". Do you think that with 80 lbs. boiler pressure I shall be able to get ¼ horse-power from it? *A.*—Yes. 2. I have been advised to make a boiler by coiling 18 feet of ¾" pipe, the coils to be 1" apart and a 3" pipe in the center of coils, to which the coil is connected at top and bottom. This to be inclosed in a furnace with a piece of 4" pipe 6" long for a steam drum. Will this do for a boiler? *A.*—The arrangement will answer, but would be better if 24 feet of pipe were used instead of 18 feet. Do not let the fire come to the pipe above the water line. 3. Shall I feed at the bottom, and what size plunger and how long stroke shall I make the feed pump? *A.*—You can feed at the bottom. Plunger 5-6" diameter, stroke 1". 4. Why do the number of revolutions have to be considered in calculating the power of an engine? I should think the power would be as much with an engine running at 25 revolutions and doing all the work it could do as when running at 300 revolutions and doing no work. *A.*—It is possible the engine may be doing more work when running at 25 revolutions, because the effective pressure against the piston may be greater, but if the effective pressure is the same in both instances it would be doing 12 times the work when running at 300 revolutions as when running at 25. If you will read an elementary work on the steam engine you will understand the meaning of horse-power, and the influence of the number of revolutions of an engine on the power developed.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

F. VanWinkle, Mech. Engin'r, 22 Cortlandt St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

The latest Improved Match Machinery is made by the White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles or cylinders. C. C. Hill, 144 LaSalle st., Chicago, Ill.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 58,) New York City.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

William J. Baldwin, consulting engineer in Steam Heating and Ventilation. Author of "Steam Heating for Buildings." Office, 96 Fulton st., New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Young men wishing to take a mechanical course or learn the machinist's trade, call or address School of Mechanical Instruction, No. 195 Front street, Worcester, Mass.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

BOUND VOLUMES of the AMERICAN MACHINIST for 1880, 1881, and 1882. A limited number of each sent by express for $4 per volume, express charges to be paid by purchaser. AMER. MACHINIST Publishing Co., 96 Fulton st., New York.

"HOW TO KEEP BOILERS CLEAN."—A book of seventy-two pages, telling how to prevent scaling, foaming, priming, and burning, with other valuable information, will be sent to any address FREE of postage, by James F. Hotchkiss, 86 John street, New York.

Any of our readers who have complete files of Volumes I. and II. in good condition, bound or unbound, can probably find a purchaser by addressing us, and stating the lowest price they will accept. AMERICAN MACHINIST PUBLISHING COMPANY, 96 Fulton street, New York.

Wanted—Correspondence with engine builders, boiler makers, and supply dealers in steam goods. We manufacture the *cheapest* Injectors and best Steam Jet Pumps in this country, and offer to *live men* the most liberal terms ever named. Drop postal for particulars to J. B. Sheriff, Son & Co., 68 Water St., Pittsburg, Pa.

"Useful Information for Steam Users"—a 100-page illustrated pamphlet, carefully compiled from the best authorities, on the care and management of the steam engine and boiler, with hints for engineers and firemen. Engineers everywhere should have this work. Send 25 cents in P. O. stamps for a copy. The J. N. Mills Publishing Co., 145 Broadway, New York.

The Hoffman Lubricator, for stationary and locomotive engines, is a perfect success, being the simplest and most perfect-working lubricator made; only one connection with the steam-pipe (no column of water to freeze). Manufactured under letters-patent issued March 6, 1877; November 8, 1881; May 2, 1882; and May, 1883, by O. A. Jenks & Co., who will prosecute all infringers of said patents. Send for circulars to O. A. Jenks & Co., P. O. Box 287, Binghamton, Broome Co., New York.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

Credits.—Ealy's "Blue Book," July, 1883, just published, contains a complete classified list of over 100,000 names of machinists and dealers in machinery, railway machinists, engine and boiler makers' supplies, brass goods, metal, etc., in United States and Canada. The book is condensed making it much more convenient to handle than a larger agency book. It gives the financial standing and paying qualities of all dealers and manufacturers in the above-mentioned lines of trade. For terms, etc., address The John W. Ealy Company, 51 Chambers street, New York, or 79 Dearborn st., Chicago, Ill.

The Hoffman Lubricator with Automatic Attachment for locomotive engines. This lubricator is operated by a direct current of steam (no water column to freeze in cold weather), and having a lock-feed operated with a key, which regulates the current of steam, causing the cup to feed any required number of drops of oil per minute (with the valves wide open) when shut off on a down grade, or when pulling up the same. It can be set at the required number of drops per minute and locked, so that it will run to the end of the road without any attention, feeding the same number of drops regularly, and when once set does not require to be adjusted every time it is filled, but open the valves and it will come to its regular feed every time. One of these simple cups oil both cylinders and air pumps at the same time. Engineers say that it is all they can ask for it. No locomotive should be without it. Address O. A. Jenks & Co., P. O. Box 287, Binghamton, Broome Co., New York.

MANUFACTURES.

The Mansfield, Ohio, Bolt and Nut Works are to remove to Toledo.

W. H. Lord will erect a two-story shop at 73 Hubbard street, Chicago.

E. W. Bliss, Brooklyn, N. Y., is preparing a new catalogue of his presses and machine tools.

Louis Bossert, 6 and 8 Union avenue, Brooklyn, N. Y., is to erect a four-story factory on Johnson avenue, in that city.

Jas. S. & Thomas Elkinton are to erect a four-story brick factory 60x150 feet at Eighth and Mifflin streets, Philadelphia.

F. O. Swannell will erect a three-story factory and warehouse on Division street, cor. Hawthorne, Chicago, to cost $17,500.

Hunt & Co., of Baltimore, have made arrangements for the erection of an extensive canning establishment at Apalachicola, Fla.

Simon Strauss, 179 Lewis street, New York, has a permit to erect a five-story brick factory on Seventy-sixth street, near First avenue.

Gillmore & Co., Cleveland, O., have recently added 80x25 feet to their iron foundry, and expect to put up a 70x25 foot addition this Fall.

A Chicago company has been organized for the purpose of manufacturing paper in Florida from the palmetto. They have a capital of $200,000.

It is reported that the Vanderbilt people have purchased the Wister Furnace property at Harrisburg, Pa., for the car shops of the new line, for $60,000.

The Atlas Engine Works, of Indianapolis, Ind., have opened an office and salesroom at 1308 Union avenue, Kansas City, Mo., with A. M. Morse as general agent.

The Mount Savage Locomotive Works, Mount Savage, Md., have received the contract for building locomotives for the Anniston & Atlantic Narrow-gauge Railroad.

The Ames Company of Chicopee, Mass., are doing more in their bronze department just now than for years, the demand for bronze ornamentation being felt all over the country.

The Whitman & Barnes Manufacturing Company of Syracuse N. Y., are enlarging their works, and putting in 400 H. P. of Babcock & Wilcox boilers and 100 H. P. straight line engine.

Brattleboro, Vt., found that it can get from 1,200 to 1,500 horse-power from a $50,000 dam across the Connecticut. But the cost for canal, wall, etc., will bring the whole up toward $200,000.

Ladd, Fortin & Volmuth is the name of a new firm located at 188 West Lake street, Chicago, and devoted to the manufacture of laundry machinery, engines, pumps, and especial appliances.—*Industrial World.*

It is proposed to convert the Columbus (Ohio) rolling mill into a manufactory of truss, bridge and structural iron. A year ago the mill was equipped at great expense for the manufacture of steel rails, but the venture did not pay.

The Brown & Adams Manufacturing Company, of St. Louis, will soon increase their capital stock and greatly enlarge the capacity of their works by the erection of new buildings and the putting in of new plants of machinery.

The Stedman & Fuller Manufacturing Company, of Lawrence, Mass., has been organized, with a capital of $80,000, for the manufacture of card clothing and leather belting. George A. Fuller is president, and W. L. Haines treasurer.

The *Troy* (N. Y.) *Standard* of September 8th says: "The Bessemer Steel Works will stop for repairs the latter part of next week. The works will remain idle for several weeks. The stoppage is only after a steady run of six months. There is now work enough on hand for all the coming Winter."

The Ellithorpe Air Brake Company are erecting a four-story and basement shop 50x150 feet in Chicago. It is expected to be ready for work with a force of 50 or 60 men by December 1st. They will manufacture screw-geared hand and hydraulic elevators. Henry Biedler is president, and A. B. Ellithorpe secretary.

The Saluda (S. C.) cotton factory, located near Columbia, is to be enlarged. Mr. F. E. Foard, a cotton broker of New York, is understood to be the chief mover in this enterprise. Its present owner, Mr. Johnson, is willing to sell the factory for $200,000, taking a large block of stock in the new corporation as part payment.

A permit has been issued by the Philadelphia Department of Buildings to erect a carpet factory at Lehigh avenue, corner of Marshall street. The main building will be 52x146 feet, two stories high. Another building will be 51x208 feet, one story. The boiler-room and engine-house will be 40x152 feet. J. S. Steel is the contractor.

The Brush Electric Light and Power Company of Cleveland, O., have just put in a 45 H. P. Ball automatic cut-off engine. The builders guaranteed, among other things, that the speed should absolutely count the same under full load or when entirely empty. After a careful test they have accepted the engine, and say the guarantee is fulfilled in every respect.

Lodge, Barker & Co., Cincinnati, O., report business quite brisk, having received orders in one day amounting to two thousand dollars, consisting of their new 19 and 24" lathes, valve milling machines, one shaper, and two drill presses. They have one of their new design Fox Monitor Lathes in the Cincinnati Industrial Exposition, which is attracting considerable attention.

The *Worcester Spy* says: The Pond Machine Tool Company are shipping an unusually large engine lathe to Pittsburgh, Pa. The machine has two heads swinging five feet, has a bed plate fifty feet long, and a lead screw fifty-four feet long, in one piece. The entire lathe weighs thirty-five tons, and three gondola cars will be required for its transportation.

The Lake City Tool Company, Madison, Wis., which was incorporated some time ago by Prof. E. T. Owen and Prof. Chas. L. King, of the State University, with a capital of $10,000, has been reorganized with $20,000 capital. Conrad M. Conradson and E. C. Stevens have been admitted as joint corporators. They will manufacture a new windmill, the invention of Mr. Conradson.

Hewes & Phillips, of Newark, N. J., have a planer 10'x10' and 20 feet long nearly finished for E. P. Allis & Co., Milwaukee. This planer has four heads, and is quite a ponderous tool. They have another large planer for the Cummer Engine Company of Cleveland, O. This firm is going to put in one of their heavy planers for their own use shortly. Business is improving. The boiler shop is very busy.

The Union Shuttle Company is the name of a new industry just started at East Boston, with a capital stock of $100,000. It is proposed to locate the factory on Sumner street. The company own two letters-patent for improvements in loom shuttles, which, in the opinion of leading manufacturers and mill men, are of sufficient importance to nearly if not quite control the shuttle trade, and would seem to be important.—*Boston Bulletin.*

Watts, Campbell & Co., of Newark, N. J., are building a vertical Corliss engine 30x48 for a factory in Philadelphia. This firm has about sixty orders for engines varying in size from 60 to 200 horse-power. They consider business good. Mr. Parsons, superintendent of these works, is introducing a system of gauges, arranged in binary fractions of an inch. A partial metric system was formerly in use, founded on the decimal of a foot.

The *Daily Cairo* (Ill.) *Bulletin* says: The Cairo Iron and Machine Works, of this place, are now being crowded with orders for their machine tools, which are giving the very best satisfaction wherever introduced. Mr. Reed has just returned from St. Louis, where he received orders for four lathes of different sizes from Hill, Clarke & Co., of that city. He has just shipped two lathes to parties in New Orleans, and is now in receipt of orders for two more from the same firm. His lathes have recently been purchased by the Western Nail Works, two by the City Foundry and Machine Works, and one large size by the Belleville Skein and Pump Works, that is to be shipped this week. All three firms of Belleville, Ill. He will also ship one 26-inch lathe this week to a firm in Union City, Texas. He has recently added one new drill press, and is about putting in two new planers and four new lathes to increase his capacity.

Machinists' Supplies and Iron.

NEW YORK, September 13, 1883.

The supply trade is fair with both manufacturers and dealers.

Schaffer & Budenberg, 40 John street, New York, have issued a new 60-page catalogue of their gauges, injectors, &c., also other steam-engine and boiler appliances.

Pig iron is dull at $22 to $22.50 for No. 1, and $19.50 to $20.50 for No. 2. Grey forge is nominal at $18.50 at furnace. Scotch pig is in excess of demand. Coltness, $23.50; Gengarnock, $23.50 to $23; Eglinton, $21; Gartscherrie, $23.50; No. 1 wrought scrap from yard, $24 to $25; steel rails dull at $38.50 at mill. Antimony—Hallett's, 9c. to 9½c.; Cookson's, 10½c to 10¼c. Copper is quiet, with sales of Lake at 15¼c., other brands 14c. to 14½c. Lead 4.35c. to 4.38c. Spelter—Refined, 8c. to 8¼c.; Silesian, 5c. to 5¼c. Jobbing lots of Banca tin, 21¾c.; Straits and Malacca, 21⅛c. to 21¾c. Boiler Plate sells as follows: Tank, 2¼c. to 2¾c.; Refined, 2¾c. to 2 9-10c.; Shell, 3¼c. to 3¾c.; Flange, 4¼c. to 4¾c.; extra Flange and Fire Box, 5¼c. to 5½c.; Siemens Steel Plate, 5½c. to 6c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

Wanted—Position as foundry foreman; practical abilities guaranteed. Address BOX 9, AM. MACHINIST.

Wanted—Situation as engineer or assistant; six years' experience; best of references. Address W. H. Gemmill, Iron Ore, York Co., Pa.

A mechanical draughtsman, of good technical education and experience, desires a situation. Address "Draughtsman," P. O. D 38, New Haven, Ct.

Wanted—An experienced draughtsman, who is thoroughly conversant with modern machine tools and has the ability to design machines for special purposes. Address "Special," care AM. MACHINIST.

Mechanical draughtsman, thorough in designing stationary and portable engine and sawmill work, good references, wants engagement. Address Engineer, care AM. MACHINIST.

Wanted—Situation as superintendent or foreman. A practical, wide-awake man will be at liberty October 1st, and desires a situation as above. Good references given. Address, Box 2, care AMERICAN MACHINIST.

Wanted—Superintendent to take charge of machine works manufacturing general machinery and working 75 men; good executive ability required, and one who is not afraid of competition; permanent situation for a suitable man. Address "Machine Works," care AM. MACHINIST.

Wanted—A situation as superintendent. A practical man is at liberty to take charge of a machine shop or a manufacturing business that requires a thorough knowledge of the importance of interchangeability; will give security and reference as to ability; the West preferred. Address "Superintendent," 10 Gorman street, Cincinnati, Ohio.

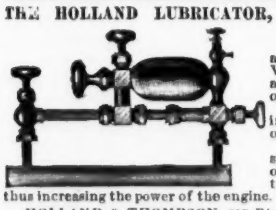
Manufacturing property for sale, 30,000 feet floor space, competing point for four trunk lines railroads, switch from door. Write for terms and description B. W. Payne & Sons, Corning, N. Y.

Wanted—One or more partners, with small capital, in a manufacturing business; sure cash sales and large profits. Address Arthur Steuart, 58 N. Charles street, Baltimore, Md.

An amateur will sell the following tools, all first class and rivalling new ones: One 13-inch 6-foot bed screw-cutting foot lathe, hardened cone spindles, Prentice make; chucks, tools, &c; two cabinet-maker's benches, and set of tools. For particulars address A. Feller, 417 Locust street, St. Louis, Mo.

Fine opening for manufacturing machinist and founder—If you are going to start business, or willing to change location to better yourself, where expenses are very low for power and rent, and a local trade from $12,000 to $20,000 per year. Modern facilities for business, growing place, extra inducement to concern of 25 or more employes. Address "Business," office AM. MACHINIST.

THE HOLLAND LUBRICATOR, VISIBLE DROP,

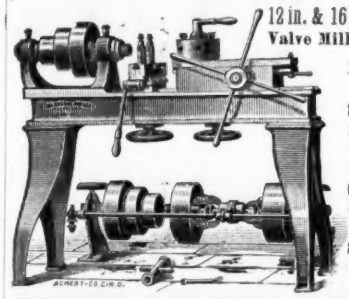


Is guaranteed to be 1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine. 2 It will pay for itself in 6 months in saving of oil, coal, and packing. 3 It will insure more speed in the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by HOLLAND & THOMPSON, 217 River St., Troy, N. Y

STEWART'S READY ROOFING

For STEEP and FLAT ROOFS of all kinds; can be applied by ordinary workmen at ONE THIRD the cost of TIN. Send for a sample and our circular which gives full directions how to apply your own roof; also how to repair leaky roofs of all kinds. Address, W. H. STEWART, 74 Cortlandt St., New York.

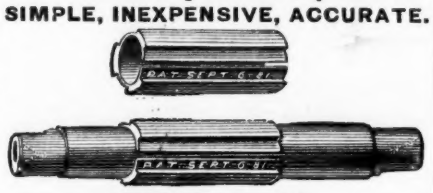
BRASS WORKING MACHINERY.



12 in. & 16 in. Monitors
Valve Milling Mach's
Double Key Lathes,
Speed Lathes
Slide Rests
Revolving Chucks for Globe Valves,
Two-Jaw Chucks,
Small Tools and Fixtures.

WARNER & SWASEY, Cleveland, O.

WILDE'S PATENT
Expanding Mandrel
is the most perfect novelty out.
SIMPLE, INEXPENSIVE, ACCURATE.



COOKE & CO.,
22 CORTLANDT STREET, N. Y.
Sales Agents and Dealers in General
MACHINERY AND SUPPLIES.
Write for circular and mention this paper.

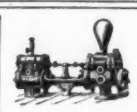
FORBES & CURTIS,
Bridgeport, Conn.
M'f'r's of
FORBES' PATENT
Die Stocks,
For threading and cutting off pipe without the aid of vise. Only one man required to thread 6 in. pipe.

Bradley's Heating Forges,
FOR HARD COAL OR COKE,
BRADLEY & CO., - Syracuse, N. Y.

THE NEW PULSOMETER,
The cheapest, strongest, most simple, compact, durable, effective and economical Steam Pump in the market, for raising liquids under and up to 100 feet. No Machinery, No Oil, No Special Care. Can be worked suspended by a chain. Will pass grit, mud, sand, pulp, etc., without injury to its parts. Needs only a steam pipe from boiler to run it. Price, 500 gallons per hour, $50; 1,200 do. $75; 3,600 do. $100; 6,000 do. $150; 10,000 do. $175; 18,000 do. $225; 25,000 do. $275; 45,000 do. $400; 60,000 do. $500; 120,000 do. $1,000. Write for illustrated descriptive book with testimonials, etc. Mailed free. Pulsometer Steam Pump Co., 83 John St., New York.

"COMPOUND" BOILER;
HOW TO USE IT AND RUN IT AT SEA.
Explaining causes of all corrosion and the formation of scale, with instructions for its entire prevention, together with useful information for maintaining Steam at Sea. Illustrated. By a Sea-going Engineer. 8vo, paper, 40 cents.
E. & F. N. SPON, 35 Murray St., N. Y.

JUST PUBLISHED!
New and Complete Illustrated Catalogue,
OF BLAKE'S — IMPROVED — STEAM
PUMPING MACHINERY.
SEND FOR A COPY.
Address, GEO. F. BLAKE MANUFACTURING COMPANY,
95 & 97 LIBERTY STREET, NEW YORK. | 44 WASHINGTON STREET, BOSTON.

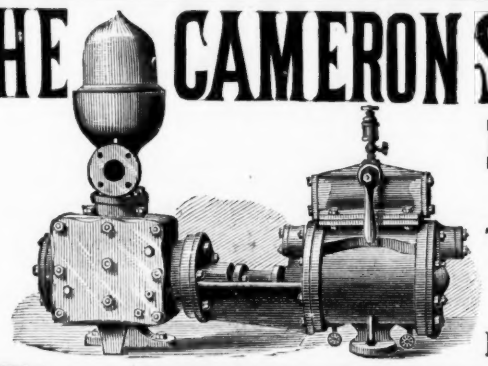


The Deane Steam Pump Co.
HOLYOKE, MASS.
Send for new Illustrated Catalogue.

92 & 94 Liberty St. NEW YORK. | 54 Oliver St. BOSTON. | 49 N. 7th St. PHILA. | 226 & 228 Lake St. CHICAGO. | 620 & 622 N. Main St ST. LOUIS.
INDEPENDENT CONDENSING APPARATUS A SPECIALTY.
MANUFACTURE
STEAM PUMPING MACHINERY
For Every Possible Duty.

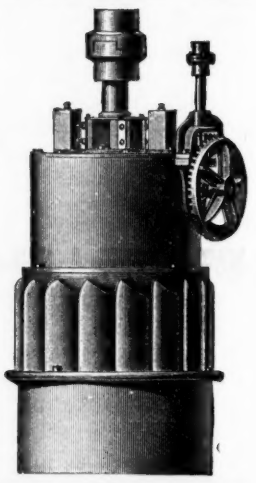
UNION STONE COMPANY,
Patentees and Manufacturers OF THE
UNION EMERY WHEEL.
EMERY, EMERY WHEEL MACHINERY AND TOOLS A SPECIALTY.
Automatic Knife Grinding Machines, Wood Polishing Wheels, Grinders' and Polishers' Supplies.
Catalogues on application. 38 AND 40 HAWLEY STREET, BOSTON, MASS.

THE CAMERON STEAM PUMP.



Is the Standard of Excellence
AT HOME AND ABROAD.
THE A. S. CAMERON Steam Pump Works,
Foot of East 23d St., NEW YORK.

THE HERCULES TURBINE
Gives more power for the same size, also better average results from full to one-half gate than any other water wheel ever made. It is moderate in cost, compact in form, and not liable to get out of order.



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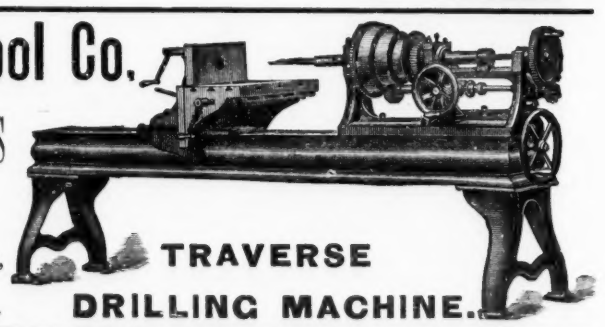

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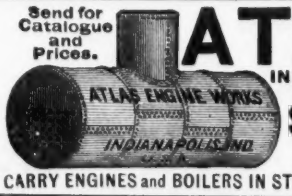

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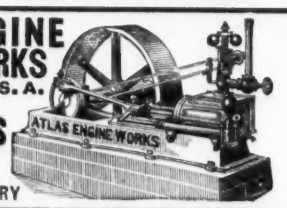

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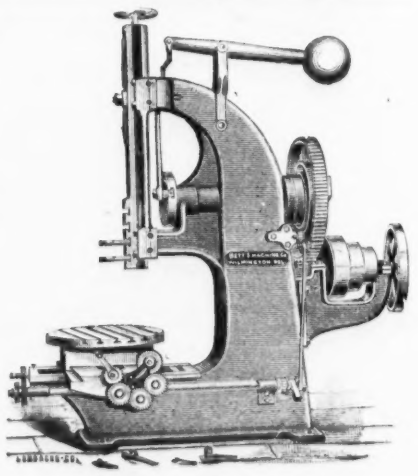

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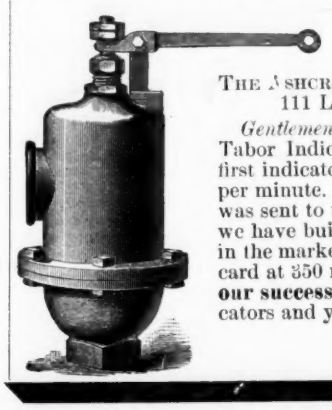

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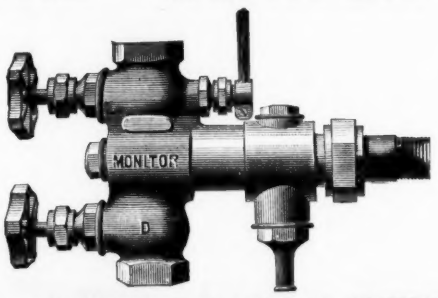

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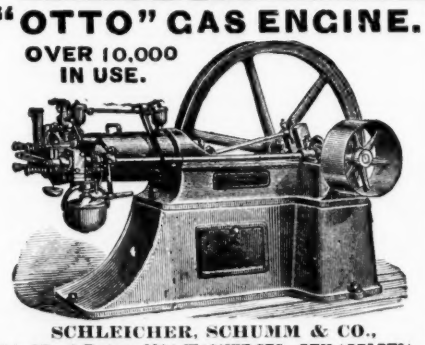

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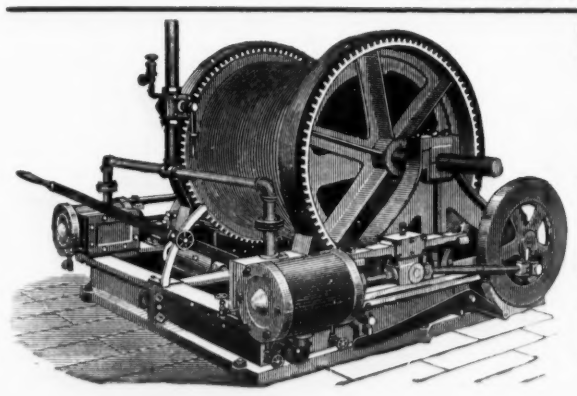

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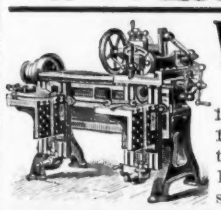

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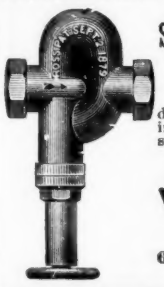

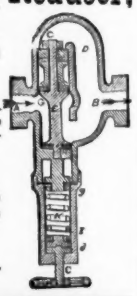

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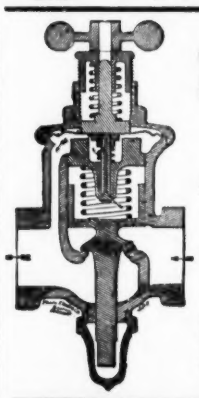

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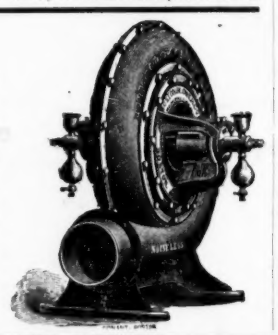

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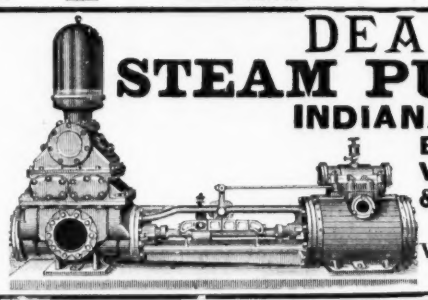

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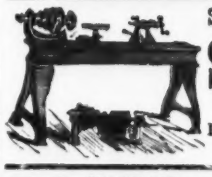

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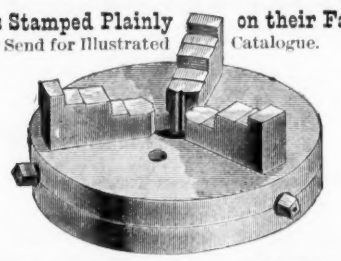

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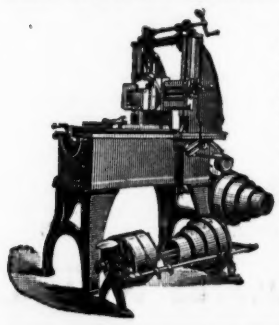

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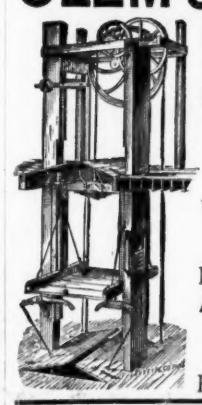

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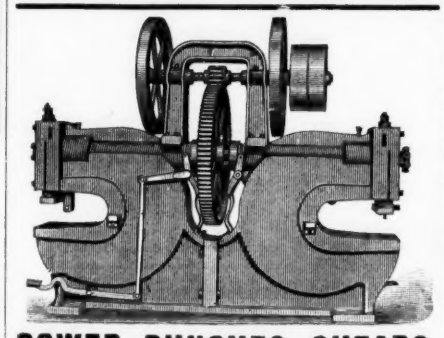

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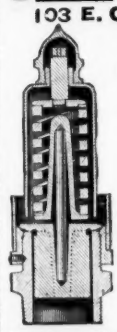

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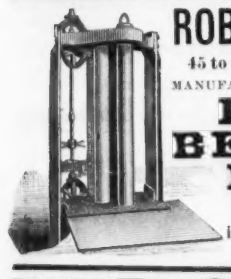

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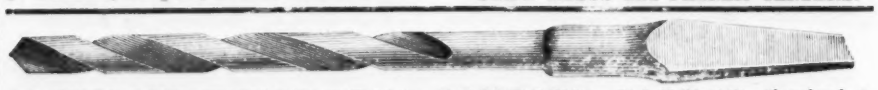

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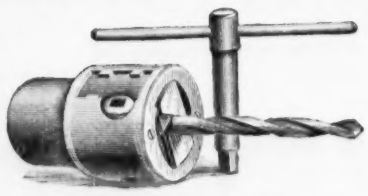

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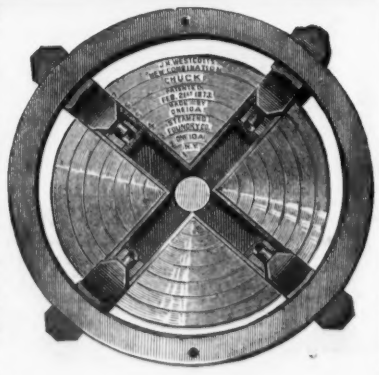

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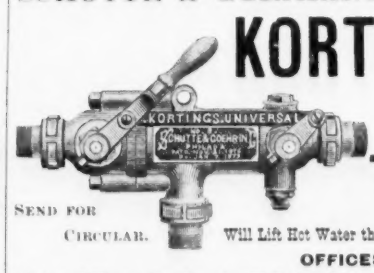

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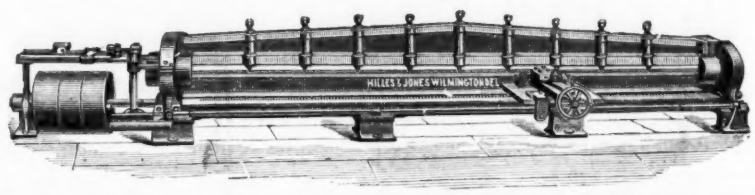

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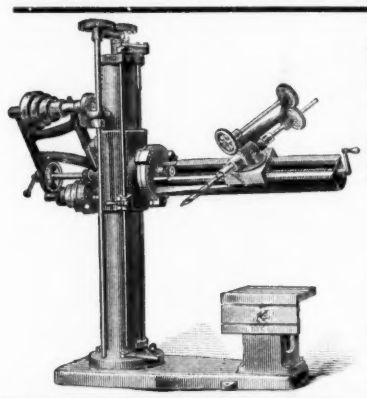

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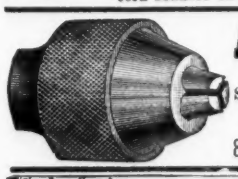

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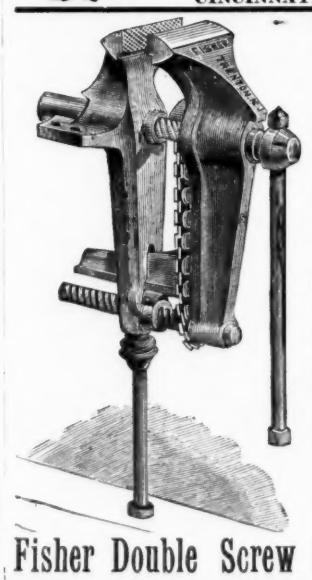

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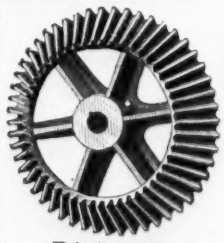
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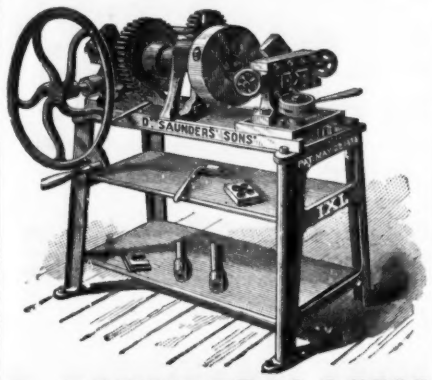

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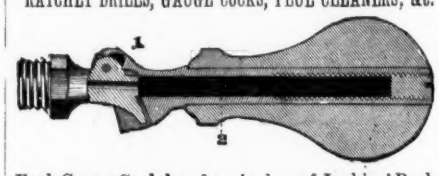

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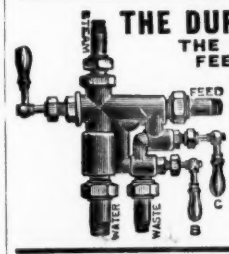

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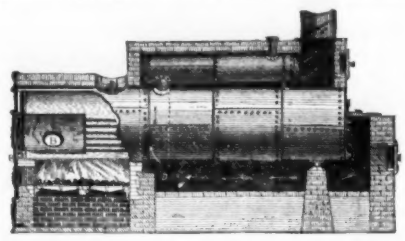

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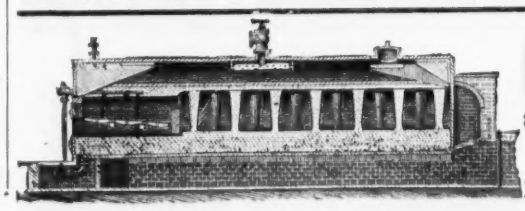

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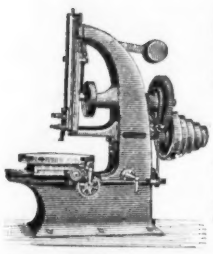

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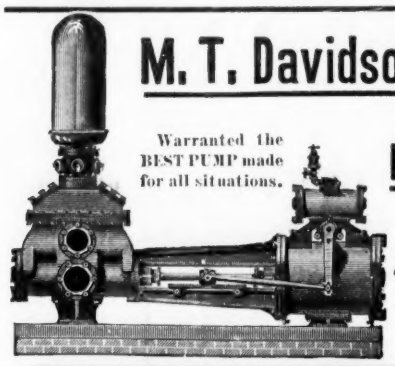

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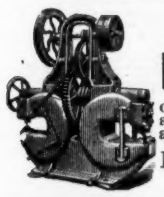

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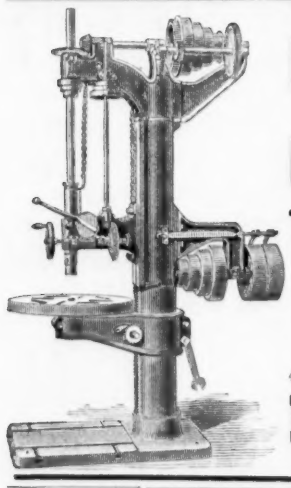

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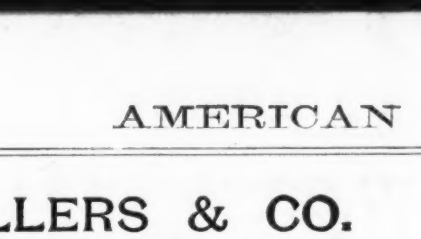

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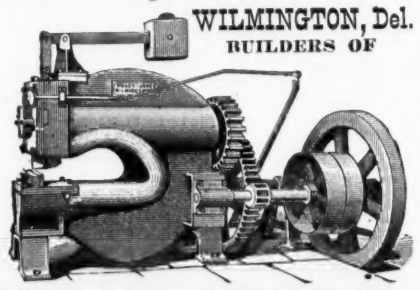

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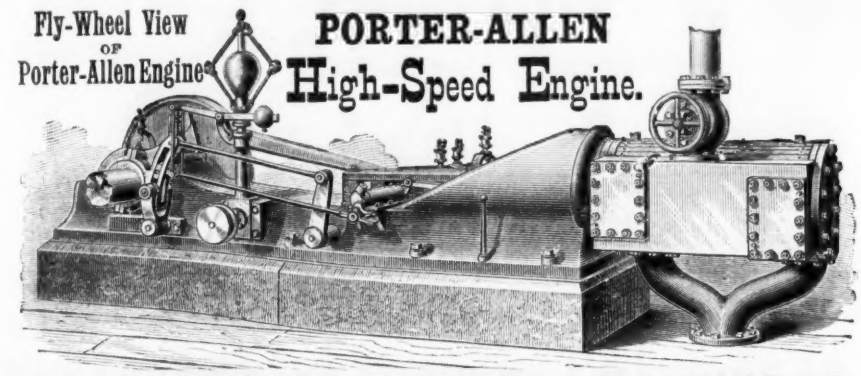

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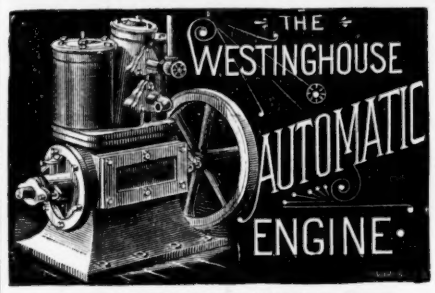

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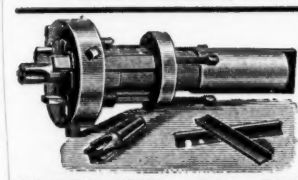

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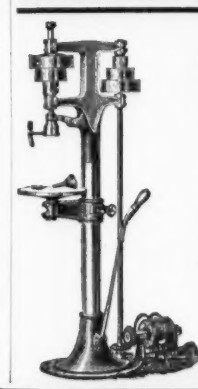

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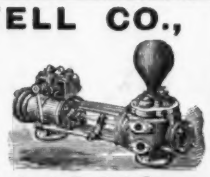

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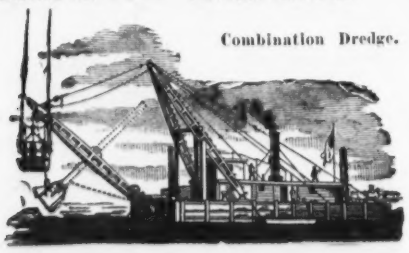

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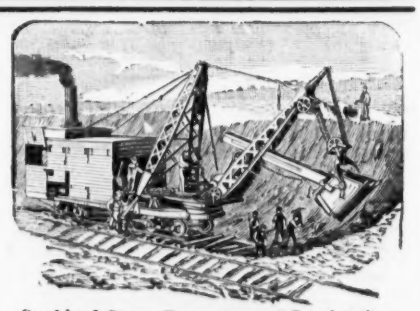

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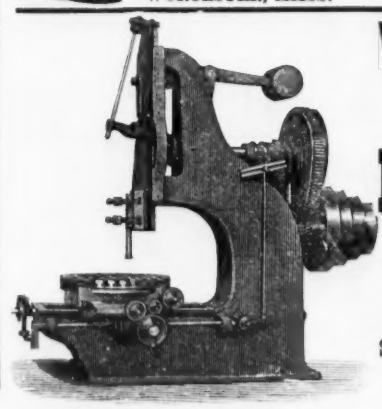

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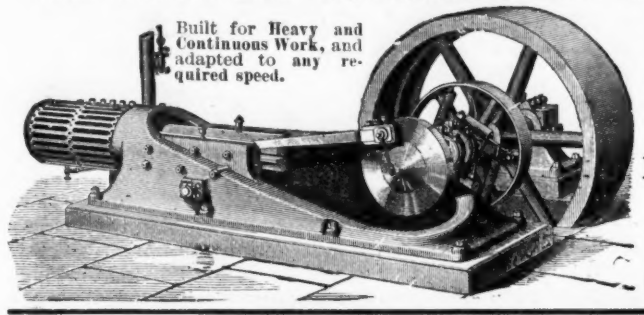

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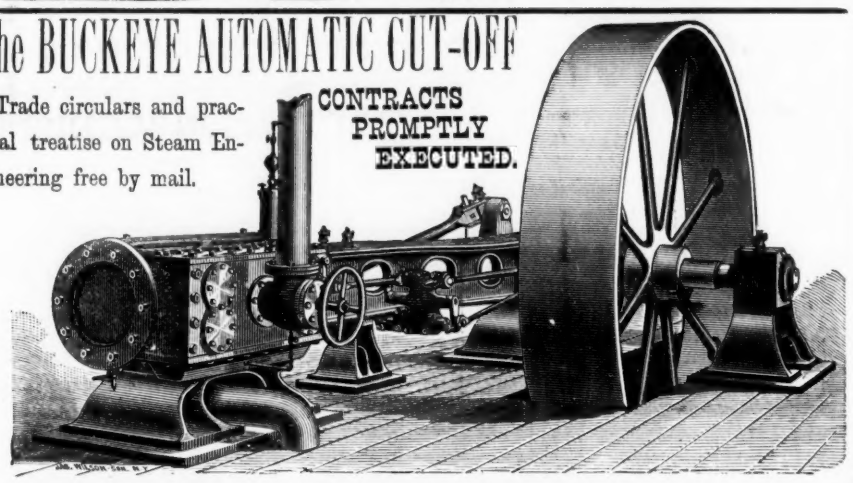

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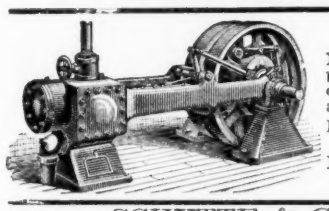

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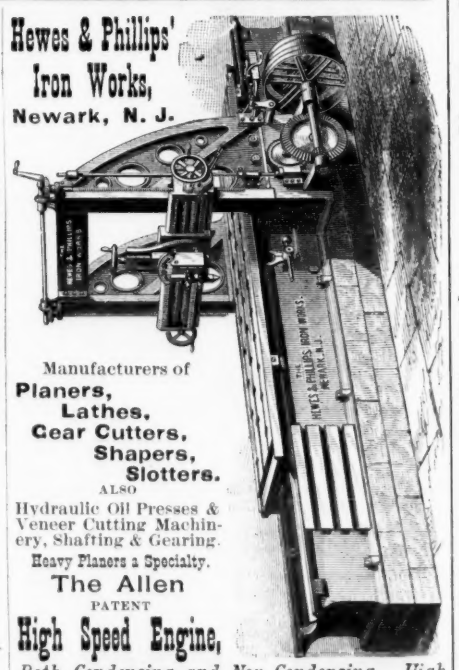

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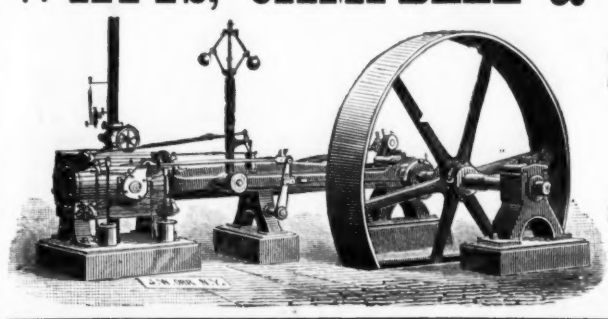

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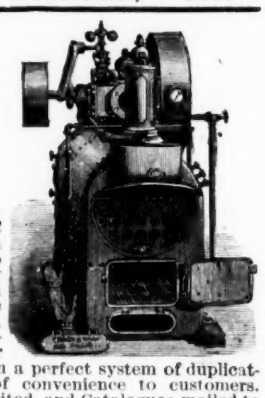

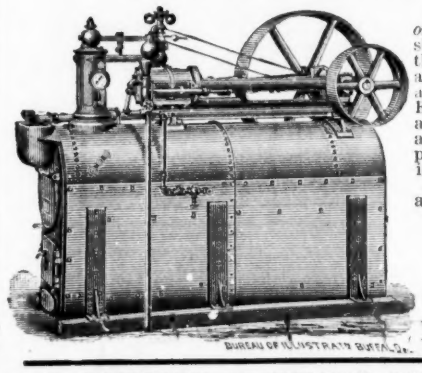

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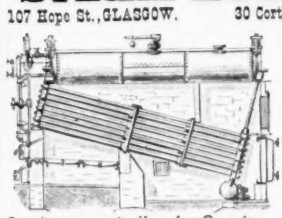

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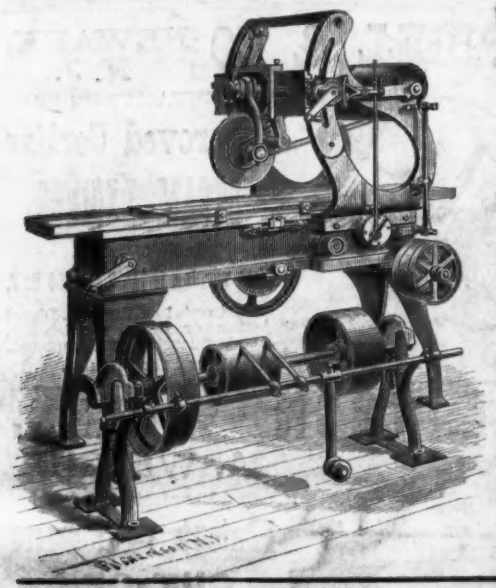

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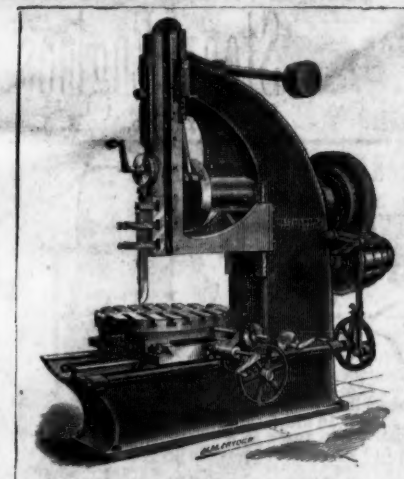

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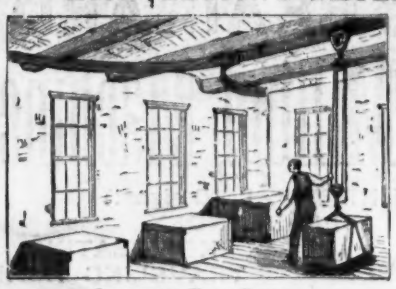

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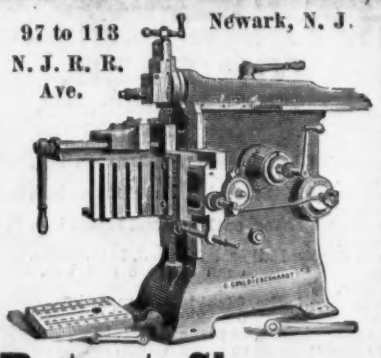

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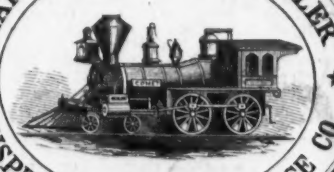

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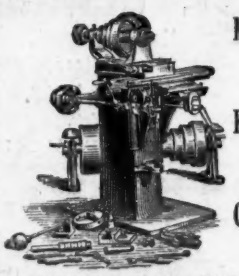

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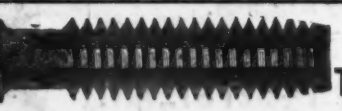

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